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FRIDAY, SEPTEMBER 20, 1907.

The salient item in the statistics of the railroads of the country for the fiscal year ending with June, 1906, which have just been reported by the Interstate Commerce Commission, is the average of gross earnings, which, for the first time, exceeds ten thousand dollars a mile. This figure differs but slightly from that given by Poor. The fact that the growth of business on existing railroads is much more rapid than the extension of railroad lines is also indicated by the statement of the density of freight traffic, which in the present report is 982,401 ton-miles per mile of line, an increase of no less than 14 per cent. over the year preceding. Another aspect of the same fact is the length of four-track railroad in the country, which now aggregates 1,280 miles. The number of cars owned by the railroads, passenger, freight and service, has now almost reached two millions. The next report—which will be for a date already three months past—will show a figure farther from the two million mark than the present one. The number of persons employed by the railroads has also reached a round figure—a million and a half—which will be surprising to the reader who has not watched the prodigious growth of the transportation industry. This is an increase of 50 per cent. over the record of so recent a year as 1901.

The results of the tests made to determine the pressure of locomotive wheels against the rails when rounding curves reported by George L. Fowler elsewhere in this issue are a very important contribution to the knowledge on this subject which up to this time has been vague and unsatisfactory. Wellington and Forney wrote from a theoretical and somewhat crude experimental standpoint on the action of wheels and trucks on curves and the Williams Bridge wreck on the New York Central more recently brought out a great mass of more or less conflicting theoretical calculations based on widely different assumptions. While Mr. Fowler's experiments unfortunately were not carried out fully enough to warrant formulating a law expressing the relation between speed, curvature, wheel loads, wheel base and the side pressure against the rail, the incomplete data obtained give grounds for casting doubt on the theoretical calculations which give results much lower. Some of the complex stresses involved must have heretofore been overlooked or misapplied in making assumptions. The best proof of this is that in the case of the Williams Bridge wreck all of the facts tend to show that the rails were spread by the action of the locomotive while all the calculations so far published give stresses which are below the ultimate strength of the fastenings. It is to be hoped that further tests

along this line will be carried out in the near future in order to establish definitely the pressures which must be safely provided for. The apparatus has been perfected sufficiently to give reliable results under any normal conditions of speed, curvature and wheel loads, and nothing now remains but for some railroad to provide the necessary track and locomotives to be tested.

A member of the motive-power department of a large road writes to ask for information as to the average natural life of passenger cars, especially on large systems having branch lines on which such cars can be run after they become unsuited for main line service. We do not know that any statistics on this subject have ever been compiled. Car men, when asked this question, generally answer, "about 25 years." But they do not mean by this that as a result of deterioration the car at the end of that time is suitable only for the scrap heap. Passenger cars are maintained at all times in condition to transport passengers safely; therefore from the standpoint of their physical condition their lives are without a limit. Freight cars not infrequently reach a state of such general dilapidation as to be condemned, but not so with passenger equipment. When passenger cars are condemned, it is because they have become so antiquated in style and arrangement as to be unfit for further use. This is the basis for the 25-year estimate. During that period, and even a shorter one nowadays, a car will have passed through all the stages of service from the splendors of the "crack" limited, down through local and branch line service, to end up possibly in a work train or some such humble service before going finally to the scrap heap.

The rate of depreciation allowed in the rules of interchange for passenger cars might be taken by the uninformed as a basis from which to compute the average life of passenger equipment. That is not the case, however. When the passenger rules were first adopted—in 1890—they contained no provision for valuation of destroyed cars. The committee appointed to revise these rules in 1900 included in their proposed revision a clause for settlement for destroyed cars, in which allowance for depreciation was made at the rate of 4 per cent. a year up to 60 per cent. of the original value of the car. This was rejected by the association, however, and the code remained without such a clause until 1906. The present revised rules were then adopted, and for the first time terms for settlement for destroyed cars were laid down. The depreciation allowance is at the rate of 3 per cent. a year up to 50 per cent. of the original value of the car. This figure is altogether arbitrary,

however, and was agreed on in response to the demand that the rules contain such a clause. It is thought by many to be too high, this doubtless being the case when one's own car is destroyed; when it comes to paying somebody else's claim the allowance probably seems much too small.

One of those entries not conspicuous in itself, but whose variation upward casts its deep shadow ahead, appears in the item "taxes" on the railroads of the country as returned for the years 1905 and 1906 in Poor's Manual soon to be published. For the year 1905 the taxes were \$54,553,620; for 1906 they were \$68,169,833, an increase of \$13,616,213, or about 25 per cent. During the same years railroad mileage of the country increased only about 2½ per cent., and total railroad assets which, in a rough way, may be regarded as the "gross" object of taxation, increased somewhat less than 8 per cent. Taxation, in ratio, thus went up ten times as fast and far as mileage and three times as fast as total railroad valuation. But this is not all and is a meager and deceptive test, for the taxes for 1906 were, in fact, based on assessments and on tax methods in force during the previous years and before "corporation baiting" got its full sweep and swing. The data of railroad taxation are, practically, two years behind, and not until next year, at the very earliest, shall we be able to measure the reach of the new taxation impacts due to state legislation during the year past. A good many legislatures have been giving the subject attention adversely to the railroads, and in two or three states, like New Jersey, the changes have been severe, almost revolutionary. The outcome is not yet. But we venture to predict that when the final accounting is had in the courts and elsewhere of the railroads as creditors of the public the increment of taxation will cut no small figure. If it results in harmonizing the medley and welter of tax expedients in the various states there may be a final gain even if coupled with some antecedent loss. Meanwhile, as a theoretical study, at least, economists may well stand aghast at the complexities of applying existing mazy and hybrid railroad tax methods to state or federal plans of "re-valuation."

Organizations of shippers to bargain for freight rates are proposed by a correspondent in another column. Shippers do thus organize to some extent now; and the National Industrial Traffic League, lately formed, proposes to cover the wide field more systematically than it has been heretofore covered. The only new suggestion offered by our correspondent, therefore, is that Boards of Trade be clothed with some official authority. This suggestion is offered with evident diffidence, as well it may be; for a trade organization which is to have real authority to speak for individual shippers should have only very limited powers. Perhaps the power to advertise itself as a public body, to gather facts and to record and certify to votes or letter ballots would be about all that it would be safe to begin with. The desideratum is to establish a body which could promptly and truly represent all of the shippers and receivers within a given territory—perhaps a county or half a state—while still retaining the close relations between individuals and the central organization that is to be seen in the Merchants' Association of New York and like organizations in other cities. The statutes forbidding preference for one shipper over another are now everywhere construed very strictly, so that a railroad traffic manager who wishes to consult "the public" before making a change in a rate must be careful to find out just who the representative of the public is; or, rather, just what "public" a given representative has the right to speak for. Hence the need of a shippers' organization recognized by the state. If a voluntary and unincorporated merchants' association should freeze out a single merchant, a railroad manager dealing with the association would have to be on his guard against being jailed for discrimination. Is it practicable to establish an efficient and impartial shippers' committee which all classes of shippers would support?

In the point made by our correspondent concerning the partisanship of state railroad commissions there is a slight suggestion of humor. These bodies have indeed become so intensely partisan, and their partisanship so pleases the public, that the old idea of an unprejudiced commission seems in danger of dropping out of sight. In the new law passed this year in Georgia, the radical members of the Legislature have gone so far as to intimate that the less a candidate knows about railroading and about law, the better will be his chance of appointment! What other interpretation can be put upon that clause of the statute which names the qualification of candidates and in so doing expressly stipulates that

these two branches of knowledge shall be ignored? We have called this humorous; but probably we are wrong. The fear of getting pro-railroad men on commissions seems to be a serious matter; and in other states than Georgia. Is it impossible to get fair-minded men who are not devoid of legal and railroad knowledge? Even the carefully prepared New York state law, fathered by Governor Hughes, seems to assume that the Public Service Commissions are liable to pursue the same headlong, ignorant course pursued by the legislatures, for it provides for a regular salaried lawyer as adviser to each of the two commissions. Governor Hughes himself, a thoroughly public spirited man, seems to be possessed by this same notion that only through partisan commissions can the railroads be curbed; for in selecting 10 commissioners, he seems to have found only two who were familiar with railroad affairs. It would be hard to find another state where there has been even this slight recognition of "the other side." In the present state of mind of the governors and legislators of many of our states the only way for a commission to satisfy what seems to be public sentiment is to proceed with feverish speed to "jump on" the railroads at every vulnerable point. As long as this is so the least that the conservative legislator or the conservative adviser of a governor can do is to see that a lawyer, presumably level headed and not carried away by the ill-considered behavior of the legislatures, is appointed to stand by and restrain zealous commissioners, so that their course shall be somewhere within the bounds of reason. But what a commentary on the meaning of "Commission!" The normal function of a commission—which is a committee—is to investigate and report upon the whole of a subject—that is to say, to fairly set forth all aspects of it. Partisanship is excluded, almost, by the word itself. If the present tendency continues the statutory legal advisers will be the real commissioners; for a man possessing accurate and intimate knowledge of a subject must inevitably prevail finally over a man, or a dozen men, swayed only by impulse. Georgia has provided for a legal adviser to the Commission, the same as New York.

There are indications that the problem of securing better rails is rapidly approaching solution, and that this favorable result is primarily due to publicity of the bad condition, which has enabled the American Railway Association to act for all the railroads in a united investigation. A significant incident is that the Bethlehem Steel Company offers to furnish rails for a moderate advance on the \$28.00 price, with .04 phosphorus and a 20 per cent. discard from the ingot. If for an increased cost of less than 25 per cent. the railroads can have rails which are reasonably safe and with a life more than double, a considerable improvement in the situation is manifest. It will be recalled that following the publication of statistics of breakage and a large number of representative photographs showing the kinds of breakage, the American Railway Association, on the initiative of Mr. Wilgus, discussed the subject at its Chicago meeting, to which representatives of the manufacturers were invited, and this discussion was followed by the appointment of a committee. There are now in session meetings of a sub-committee of the American Railway Association's committee, consisting of Mr. Richards, of the Pennsylvania; Mr. Isaacs, of the Southern Pacific; Mr. Montfort, of the Louisville & Nashville, and Mr. P. H. Dudley. In conference with them are four representatives of the manufacturers: Mr. Wood, of the Maryland Steel Company; Mr. Bostwick, of the Carnegie Company; Mr. Carhart, of the Illinois Steel Company, and Mr. Abbott, of the Lackawanna Steel Company. This sub-committee will report early next week, and there is possible, indeed there is some hope for, an agreement on specifications acceptable to the manufacturers. The attitude of the manufacturers has entirely changed, apparently, if words count for anything. Both Mr. Schwab and Judge Gary have made public statements to the effect that their rail orders have stopped, awaiting an agreement on specifications acceptable to the railroads. Judge Gary adds a statement of that kind of truth which is self evident, but which has more than a commonplace value in view of the development of facts about defective steel rails and the firm attitude of the railroads. Judge Gary says:

"The time has gone past for the great corporations to ignore the public and the public interest. 'The public be damned' policy, if that phrase was ever actually used, will not go in these days. The heads of our great industrial enterprises can never adopt that attitude, not alone as a matter of policy but in the interest of their own undertakings."

The only feature of the distressing collision in New Hampshire, reported this week, that is at all novel, is the statement of the cause, given by the officers of the road to the newspapers, which is clear

and frank, and evidently as full as can be asked for at this time. The officers even tell us the length of service of the two men between whom lies the responsibility for the error in the telegraphic order delivered to the freight conductor. This is a detail which is always of interest to the public. The recognition of this fact by railroad officers nowadays is perhaps to be credited to the Interstate Commerce Commission, which asks this question in connection with the reports of accidents which are required by the Federal law. The New Hampshire collision is due to an error of the same class as that which figured in the disaster at Salem, Mich., only eight weeks before. Despatchers' and operators' errors of all kinds, when they are aggregated for 225,000 miles of road, as they are in the records now furnished to American newspaper readers, are so numerous that no detail is unfamiliar. That the victims of this collision were in a light car, placed in the train between heavier ones, is also commonplace. There seems to be no end to the life of old passenger cars, although their use between heavy ones has been vigorously denounced these many years. This collision, like Salem, might be made the text for an instructive study of the best way to secure safety under the American despatching system. But why should such a study be made? Has not every railroad superintendent and trainmaster long since become convinced that the system has in it more loop holes for danger than any division officer on earth can watch and safeguard? As in repairing a thin dam made of bad material, new leaks will develop in one part while attention is being centered at another. At least, this is the incontrovertible verdict that the public is obliged to render on the basis of known results, whatever railroad officers may believe or may be trying to accomplish. The Boston & Maine is spending large sums of money on automatic block signals. It recognizes the absolute necessity for the adoption of the space interval principle in running trains, in place of the time-interval-and-train-despatcher method. As on most other roads, the process of introducing the better method is slow. Even the state railroad commissioners of Massachusetts, Indiana and New York, who recognize the need of the block system, are slow. Possibly this slowness is financially justifiable. But meanwhile people are being killed by the car-load.

MORE DIFFICULTIES IN GEORGIA.

The Georgia Railroad Commission finds that the gross rate reductions received through the instrumentality of the commission by 69 Georgia cities and towns, based on the business of 1906, amounted to \$1,896,199. But Commissioner Joseph M. Brown points out that, in the meantime, the price of commodities affected has actually increased. "It is clearly proven," he says, "that the reduction in freight rates, although the unjust discrimination caused by them required that they should be made, signally failed to reach the masses of the people. And let me add that the increase in prices has often been made at the expense of even the retail dealers."

Mr. Brown continues: "It is, therefore, certainly pertinent to ask, 'Shall the transportation facilities necessary for the commerce and intercourse of the people of Georgia be made subservient to the demands for other and greater dividends for the manufacturers of Georgia and of other states from which Georgia jobbers buy? Ought not the railroads to be protected in the power to furnish to the people prompt and safe service for person and property, and should not future reductions in their revenues be made on such items as will reach the masses of the people?' There are thousands of citizens of Georgia who own railroad stocks and bonds. Shall their sources of support be destroyed for the purpose of giving other dividends to the manufacturers and jobbers? Remember, again, there are tens of thousands of people in Georgia who are members of the families of railroad employees. Shall they be reduced to beggary by bankrupting the railroad companies in order to give the manufacturers and jobbers another dividend? In the mean time it is certainly pertinent to ask directly the question which is clearly inferred from the facts I have adduced, viz.: 'Wherein has it benefited the people to reduce the freight rates?'"

Of course Mr. Brown is not arguing a case for the railroads. His point of view is not that railroad rates have been made too low, but that the wicked manufacturers, all over the state, are charging too much. Why not appoint another full-powered committee to supervise all wholesale and retail prices? The step is not a very long one, and the citizens of Georgia could then buy shoes at a dollar a pair, or whatever price the commission in its wisdom might fix. There is abundant historical authority for this.

Rhode Island, for example, decreed in 1786 that merchants must accept at par the unredeemable, depreciated paper currency in payment for their goods. There were no ifs, buts or ands about this decree, yet somehow it failed of its purpose, because the unregenerate merchants closed their shops! We leave it to the reader to apply the parallel, if there is one, in this example of rate regulation *in extenso*.

THE ERIE AND THE SOUTHERN DIVIDENDS.

At a time when the cost of capital is so great that it is practically out of reach, except in small quantities, it is not surprising that the Erie Railroad, perhaps the most prominent example in the country of a financially top-heavy system, should be chary of its dividend payments. And when to this high cost of money is added local legislative hostility, discouraging new investment at the same time that it reduces the earning power of present investment, it is natural that the Southern Railway should adopt the conservative course of cutting its preferred dividend from five to three per cent, to release funds much needed for improvement work. In the 1907 fiscal year, the Southern earned \$56,657,991, as against \$53,641,436 in the same months of the year previous, but net decreased nearly two millions in that same period, and it may be safely hazarded that the company did not earn more than the requirements on the three per cent. basis. But it is also true that expenditures for maintenance of way, structures and equipment have been on so liberal a basis, during the past two years, that money is being plowed back into the property, and operating expenses are somewhat higher than strict necessities of upkeep would require. In the 1906 year the company charged maintenance of way and structures at approximately \$1,034 per route mile, locomotives at \$2,632 per locomotive, passenger cars at \$955 per car, and freight cars at \$72. It is obvious that these figures represent, as they have represented for some years past, a wholesome and commendable effort to do as much work on the property as possible out of earnings, and the Southern, like all the roads in its territory except, perhaps, the Louisville & Nashville, has urgent need of this sort of rehabilitation. Last fall, the new financing of the road and the continuous betterment expenditure out of earnings began to bear fruit, and the road was apparently earning its full preferred dividend and some two and one-half per cent. on the common besides. But all this year the expense account has been mounting fast, especially in labor costs, both by the hour unit and by the efficiency unit, while there is scarcely a state which the lines pass through that has not sought to reduce the company's income and at the same time to increase its taxes and to regard all failure of service as wilful, as President Finley has pointed out, and to penalize such failures heavily. As we see it, when a railroad is making every effort and spending all available funds—even funds which might properly be credited to the dividend account—in an attempt to perfect its physical condition; excessive taxes, excessive damage awards and penalties for unsatisfactory performance tend directly to wrecked trains, and cost human lives. The southern legislatures may eventually learn that promiscuous attacks on the credit and earning power of their carriers, combined with enforced additions to the expense accounts, do not lead to better railroad conditions in the South; in the meantime there must be wrecks, and dividends must be passed.

The case of the Erie is quite different from that of the Southern. When the 1907 earnings were given out, it was shown that there had been a substantial increase, not only in gross, but in net, in spite of the prevailing costs of labor and materials. According to the face of these returns, which cannot be analyzed until the detailed statement of transportation and maintenance costs is published, dividends on the preferred stock were earned twice over, and they were declared at the usual rate, but made payable in 1917, four per cent. warrants for the amount being given to stockholders.

The Erie has a highly competitive position in trunk line territory; it is terribly burdened by the sins of its fathers, and the skill and courage of its president in putting the road on its feet, financially and physically, has been one of the noteworthy achievements of the last decade. But money for improvement work it must have, both to continue the grade revision, now well in hand, and to provide additional heavy equipment, and the ordinary channels through which money is procured are, to all intents, closed to the Erie at present. With a good surplus, the management may well have hesitated to pass the dividends, not only in justice to the stockholders, but because of the effect on the company's credit. The warrants represent what may be called an enforced loan of \$2,-

500,000 at four per cent., while it is quite certain that the market rate for this sum would have been in the neighborhood of double that rate; more rather than less. The problem of the Erie may be stated as that of keeping its property in condition and continuing to do business until the other trunk lines grow up to its capitalization. There is no longer any question that it is urgently needed as a carrier, and it should normally show good increases, year by year, until the debt looks less formidable in proportion to the traffic than at present. But meantime it is unavoidable that new capital should be put into the property, and the year 1907 has been a crucial one in securing this capital, bringing out, as it has, two interesting expedients, the expensive, discounted-paper type of loan, last spring, and the economical dividend warrants, this fall. It is rather curious to note that the cash value of these warrants at the present time bears just about the same relation to their par value that the reduced Southern dividend bears to the full five per cent.

Train Accidents in August.¹

Our record of train accidents occurring on the railroads of the United States in August includes 18 collisions and 25 derailments and three boiler explosions, 46 accidents in all. This record is not published in full except in the cases of the few accidents which are especially prominent—in the present instance four collisions and eight derailments. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—is given at the end in the shape of a one-line item for each accident, showing date, location, class and number of deaths and injuries. This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager.

The accident most fatal to passengers in August appears to have been that at Kelly, Pa., on the 6th, where five passengers and one trainman (the engineer) were killed and 18 passengers were injured. Southbound train No. 6 was derailed by running into a freight car which had fallen upon the southbound track in consequence of a break-in-two in a northbound freight. The passenger train was running about 40 miles an hour. The engine was wrecked and three passenger cars were overturned.

The derailment at Red Rock, Okla., on the 1st, is reported as unexplained. Both of the passenger coaches, together with the baggage car and the locomotive, fell into the ditch.

The derailment on the Chicago, Rock Island & Pacific, at Thompson, Neb., on the 22d, was due to the opening of a derailing switch in front of a passenger train when it was too late for the train to be stopped. The tender, mail car and baggage car were overturned and the engineer was killed. The train was running at about 25 miles an hour. The point of derailment was the approach to the crossing of the Burlington road, and the signalman—who decamped immediately after the derailment—is supposed to have become confused and to have assumed that the train approaching was on the Burlington track. There was, in fact, no Burlington train in sight.

The accident at Kingsley, Miss., on the 22d, was the derailment of a freight train which fell against the cars of a work train standing on a side track, causing the death of seven laborers of the work train.

The butting collision at Sapulpa, Ind. T., on the 24th, is reported as due to the failure of the train dispatcher to issue the proper order to the eastbound train. Of the killed four were trainmen and the fifth was reported as unidentified.

The collision at Foul Rift, N. J., on the 15th, was due to the neglect of an operator to deliver an order to the southbound train. This operator (at Belvidere Junction, two miles north of Foul Rift) was ordered to hold a southbound freight, but he did not do so,

and this train collided with a northbound train. The engineer of the northbound train was killed and three trainmen were injured. The operator was not the regular attendant at that station. A coroner's jury found the operator responsible, but recommended that no legal action be taken against him because of the failure of the dispatcher to comply with the rule which requires meeting orders [if practicable] to be sent so that the superior train shall receive them at some station before it reaches the appointed meeting place. Whether or not the words which we have shown in brackets were in the rule, or, if in it, were given weight by the jury, does not appear. The jury deliberated 12 hours.

The derailment at Chester, Mass., on the 4th, was due to the runaway of a heavy eastbound freight train on a 1½ per cent. grade, about 20 cars being wrecked. The train after running about 10 miles at a high speed collided with an empty engine which was backing down the grade, but the empty engine, though damaged, did not leave the track. The derailment of the freight appears to have been immediately due to damage sustained by its engine when it bumped the empty engine. The failure to control the speed of the freight train was due to neglect of the train crew to test the air after taking on four cars at the front end of train at the top of the grade. Investigation indicated that an angle cock between the fourth and fifth cars was not opened, so that when occasion required an emergency application it could not be made upon the whole train. In ordinary service on this grade freight trains are controlled by hand brakes, the air being used in emergencies.

The derailment at Melrose Junction on the 7th was due to the runaway on a steep grade of a freight train made up of 50 cars loaded with coal. It occurred about 3 a.m. The train had been run properly for about nine miles down the grade but then became uncontrollable, and after running about three miles at high speed was thrown off the track at a derailing switch, the engine and 42 cars falling down a bank. One trainman was injured. The failure to control the speed appears to have been due to mismanagement of the air-brakes by the engineer.

These two runaways, though not resulting in any fatalities, are among the most costly wrecks of the month.

The collision at Auburn, N. C., on the 6th, was investigated by a coroner's jury; and the cause, as given in the words of the conductor, was "I simply forgot my orders, that's all"; and a similar neglect seems to have been the cause of the butting collision at Dalton, Ga., on the 8th.

The derailment at Tulsa, Ind. T., on the 30th, due to a train running on to a burning bridge, is reported as the fourth serious train accident near that place within a few days, all believed to have been due to the malicious acts of train wreckers.

TRAIN ACCIDENTS IN THE UNITED STATES IN AUGUST, 1907.

Collisions.					No. persons reported—		
Date.	Road.	Place.	Kind of Accident.	Train.	Killed.	Injured.	
3.	Boston & Albany	W. Brookfield, re.	P. & Ft.		2	0	
*6.	Southern	Auburn.	P. & Ft.		3	3	
5.	Missouri Pacific	Kirkwood.	Pt. & Ft.		1	3	
6.	Baltimore & Ohio	Lemont.	P. & Ft.		0	7	
8.	Great Northern	Park River.	Pt. & Ft.		3	0	
8.	W. & Atlantic	Dalton.	Pt. & Ft.		4	3	
11.	Buff. & Pitts.	Chambersville.	Pt. & Ft.		0	4	
15.	Pennsylvania	Foul Rift.	Pt. & Ft.		1	3	
15.	Ludington & Nor.	Ludington.	P. & Ft.		0	7	
22.	Penn. W.	Hagerstown.	Pt. & Ft.		1	0	
*24.	St. Louis & San Fran.	Sapulpa.	P. & P.		5	5	
25.	Baltimore & Ohio	Deshler.	P. & Ft.		1	3	
26.	Norfolk & Western	Rarden.	Pt. & Ft.		2	6	
28.	C. & N. O. & T. P.	Citico.	P. & Ft.		2	0	
27.	Int. & G. N.	San Marcos.	P. & P.		0	11	
30.	C. & C. & St. Louis	Kenton.	Pt. & Ft.		1	2	
30.	D. L. & W.	Stroudsburg.	Pt. & Ft.		1	0	
31.	A. C. L. and S. A. L.	Trilby, Fla.	Pt. & Ft.		1	0	

Derailments.					No. persons reported—		
Date.	Road.	Place.	Kind of train.	Cause of derilmt.	Killed.	Injured.	
1.	Atch., Top. & S. F.	Red Rock.	Pass.	unx.	1	29	
4.	Boston & Albany	Chester.	Pt.	runaway.	0	8	
7.	Erie	Melrose Juctn.	Pt.	runaway.	0	1	
*6.	Pennsylvania	Kelly, Pa.	Pass.	acc. obst.	6	18	
10.	Great Northern	Milan, Wash.	Pass.	unx.	0	15	
11.	St. Louis & San Fran.	Mount'n Grove.	Pass.	unx.	2	3	
14.	Southern	Brevard.	Pass.	unx.	0	6	
15.	Int. & G. N.	Latexo.	Pt.	ms.	1	1	
15.	Chic. & Burl. & Q.	Russell, Ia.	Pass.	b. truck.	0	15	
15.	Missouri Pacific	Roper, Kan.	Pass.	unx.	0	15	
*15.	Chic. & Burl. & Q.	Weston, Mo.	Pass.	b. wheel.	1	3	
16.	Wabash	Randolph, Mo.	Pass.	unx.	0	5	
18.	Great Northern	Virginia, Minn.	Pt.	b. rail.	2	1	
19.	Chic. & Mil. & St. P.	Keystone, Ia.	Pass.	acc. obst.	0	20	
20.	El Paso & S. W.	Alamogordo.	Pt.	d. track.	1	0	
*22.	Yazoo & Miss. Valley.	Kingsley, Miss.	Pt.	unx.	7	0	
*22.	Louisville & Nash.	Johns, Ala.	Pass.	loose rail.	1	12	
*22.	Chic. & R. I. & Pac.	Thompson, Neb.	Pass.	neg.	1	0	
25.	Den. & Rio Grande	Fernleaf.	Pass.	d. switch.	0	20	
26.	Southern	Red Hill.	Pass.	b. rail.	0	1	
27.	T. St. L. & W.	Bowman.	Pass.	d. switch.	1	7	
29.	St. Louis & San Fran.	Tulsa, I. T.	Pass.	ms.	0	3	
*30.	St. Louis & San Fran.	Tulsa, I. T.	Pass.	bridge.	0	2	
*30.	Atch., Top. & S. F.	Shoemkr, N.M.	Pass.	unx.	0	3	

Other Accidents.					No. persons reported—		
Date.	Road.	Place.	Kind of train.	Cause of derilmt.	Killed.	Injured.	
1.	Pennsylvania (West).	Urbana.	Pt.	boiler.	3	0	
5.	Atch., Top. & S. F.	El Toro.	Pt.	boiler.	1	2	
25.	Central of Ga.	Raccoon Mills.	Pt.	boiler.	3	0	

Of the 22 serious electric car accidents reported in the newspapers in the month of August, seven are reported as having each

¹Abbreviations and marks used in Accident List:

rc.....Rear collision.
bc.....Butting collision.
xc.....Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n.....Negligence.
unf.....Unforeseen obstruction.
unx.....Unexplained.
derail.....Open derailing switch (negligence of engineer or signalman).
ms.....Misplaced switch.
acc. obst.....Accidental obstruction.
malice.....Malicious obstruction of track or misplacement of switch.
boiler.....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Ft.....Freight train (includes empty, engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

caused one or more fatal injuries, namely, Westerly, R. I.; Odell, Ill.; Brooklyn, N. Y. (two); Alliance, Ohio; La Crosse, Wis., and Charleston, Ill. The last mentioned, occurring on the 30th, was a butting collision causing the death of 14 passengers. This was reported in the *Railroad Gazette* of September 6 and 13.

Uniform Classification—Significant Testimony.

The proposal to establish one uniform classification of commodities for all freight tariffs in the United States, which has been before the country for 15 or 20 years, has been favored by the Interstate Commerce Commission and by various state railroad commissions and has been constantly opposed by railroad men; by all railroad men, we believe, who are fully conversant with the subject, except those who have deemed it their duty to try to comply with the wishes of the advocates of the change in spite of the difficulties of the task. At last, however, we have a strong voice on the conservative side from a state railroad commissioner, Mr. Mayfield of Texas. Mr. Mayfield has had long experience and his epitome of this matter is a forcible one. It is in a letter to O. P. Gothlin, member of the Ohio Railroad Commission. He says:

"In my judgment, uniform classification is little short of an illusion; it is absolutely impracticable and altogether unwise. Classification is but a process of rate making, and uniform classification, to be of substantial value, must be followed by uniform rate making, which at once demonstrates the utter absurdity of the whole scheme.

"Such a thing as uniform classification cannot be maintained within the limits of even a state, much less the Union. For example, take the conditions that prevail in the state of Texas, where rates on state commerce are prescribed absolutely by agents of the government, and uniformity in all respects is looked after with especial care.

"The railroad commission of Texas has prescribed a classification of its own, and the fact remains that not exceeding 15 per cent. of the commerce of this state is governed by this classification, and I dare say the same general conditions prevail in the territory of Official, Southern and Western classifications.

"Within this state we have upwards of 40 separate commodity tariffs, and most of these separate tariffs embrace innumerable commodities, and the whole of them means nothing more nor less than a classification different from that prescribed in the Standard Classification.

"There are many factors to be considered in rate making, and an important one is the character and density of a commodity for which a rate is prescribed. These conditions shift and differ as you shift and change from one section of the country to another, and rates must be prescribed taking into consideration those shifting conditions; and, therefore, I repeat that the scheme in my opinion is visionary and absolutely impracticable."

The school which the Pennsylvania Railroad has established for the training of telegraph operators and station agents at Bedford, Pa., was opened on Monday last, September 16. The manager is Mr. J. F. Cessna. It is estimated that the Pennsylvania will need 700 additional operators to comply with the federal eight-hour law which goes into effect next March. Students are to be taught not only the work of the telegraph office, including the rules for handling dispatchers' orders, but also the general duties of station agent, including practice in keeping station agents' accounts. It is expected that the course will require from six to eight months, and "immediately upon its completion graduates will be provided with salaried positions." A nominal charge of \$2 a month is made for tuition. The company advertises for students between the ages of 17 and 25 possessing good health and a fair knowledge of English, mathematics and geography; "men of ability, energy, decision and action." As the *Railroad Gazette* is constantly setting forth in all departments of railroading the highest ideals that it knows of, it will be ungracious to question the judgment of that officer of the Pennsylvania who seeks men like General Sherman or Bismarck or Gladstone to fill the position of telegraph operator; but unless he pays a good deal higher wages than prevail on most railroads he will probably have to put up with men possessing perhaps one, two or three of the four virtues which he names. Men of 25 who possess any of them in a marked degree will be found to be now getting from \$75 to \$100 a month, and they don't have to work alone out in the woods. Candidates 17 years old may possess the first two or three, at least potentially; but to possess all may be a disadvantage. It may be better if the young men do not develop the third and fourth until after they have been trained awhile. Possibly this neighborly criticism applies only to the press agent, however. The main idea of the school is highly commendable. It is unbusinesslike to depend for recruits on self-taught operators, acquiring their knowledge in the offices of all kinds of station agents; and this notwithstanding the fact that innumerable high railroad officers began their careers in that way; and it is worse

than unbusinesslike to let a labor union rule in the matter of apprentices.

When one says that history repeats itself he usually refers to events, more or less alike, which have occurred a few hundreds or thousands of years apart; but History, like all the rest of us, now lives a fast life; hence we read of "experiments" with hoops for delivering orders to moving trains (on the Pennsylvania Railroad) which "began late in 1906." It is about 20 years, if memory serves, since the successful use of hoops in this way in India was reported in the *Railroad Gazette*. Several American railroads adopted the practice some years since, however; so perhaps "History" is not particularly interested. The Pennsylvania has introduced a modification: a holder for holding up two hoops, one for each of the two engines of a double-header. Each of the 57 block offices on the Middle Division is supplied with three holders and 50 hoops. As the Pennsylvania has an enterprising signal department, the reader may be inclined to surprise at this evidence of progress in a method of train management which has to do with old-fashioned practice—practice which does not have much use for signals. An explanation, or partial explanation, may be found in the fact that the Middle Division is the one least advanced in signaling. There being no heavy and frequent passenger service on the division, the company's investments in automatic signals and short block sections have been allotted to other divisions. On the New York Division and other well-signalized sections the strictly modern method of conveying running instructions to enginemen wholly by fixed signals is in vogue to some extent; and the use of tissue-paper orders, to be handled by greasy hands and read by dim lights, is correspondingly lessened. The hoop is a highly useful device (though it has done little for the pockets of American exploiters of railroad appliances); but we may hope some time to get beyond it.

The French papers are criticising the poor results that were obtained by the state in the operation of its railroads for the year 1906 in comparison with those obtained by the private companies. According to the report that has been issued, the net gain for the five great companies was as follows: The Nord, 8,500,000 fr.; Est, 8,000,000 fr.; Paris, Lyons & Mediterranean, 8,500,000 fr.; Orleans, 1,600,000 fr., and the Ouest, 1,700,000 fr., while the state system falls behind with a net loss of 300,000 fr. It is estimated that had the state system increased in the same proportion as the other roads it would have shown a net gain of 846,000 fr., whereas in reality it fell 1,346,000 fr. below this figure. From which it is argued that the state management is not equal to that of the private companies.

Chicago, Milwaukee & St. Paul.

Official mention is at last made in an annual report of the Pacific coast extension, but even now the undertaking is not described in any detail. The official map published with the report just issued makes no note of the new line, the only direct mention of which is as follows by President Earling:

"Companies organized under the laws of South Dakota, Montana, Idaho and Washington have undertaken and are now engaged in the construction of a line of railroad from the Missouri river to Seattle, Tacoma and other Puget Sound points. It has long been apparent that an outlet to the Pacific Coast would be of great benefit to the property of your company, and accordingly your company has advanced, and is now from time to time advancing, sums of money to aid those companies in the construction of this line. Each of the companies is progressing satisfactorily with its work, and it is expected that the entire line will be completed during the year 1909. In the opinion of the directors, large and important benefits will result to your company and also to the western companies through the interchange of the constantly increasing traffic between the Great Lakes and the Pacific Coast."

However, as was the case a year ago, there are indirect references to the new project much more definite and striking. Two years ago there was no item of "advances to other railroad companies" on the St. Paul's balance sheet. Last year this item appeared with about \$9,500,000 so advanced. On June 30, 1907, it had increased to \$32,339,271, which may be roughly taken as the cost of the new extension up to the present time. There has at the same time been a large increase in the stock of material and fuel on hand, as shown on the balance sheet. The value of this was \$2,700,000 in 1905, \$4,900,000 in 1906 and almost \$6,000,000 on June 30, 1907, the increases probably representing stocks accumulated for use on the new line. The map shown herewith, including the Pacific extension, is one recently issued by the passenger department. The line should be in operation as far as Butte, Mont., some time in the first half of 1908. An article describing progress on the western end of the extension is published on another page of this issue; a similar article appeared in the *Railroad Gazette* of July 19, 1907. The country through which the western part of the extension is to pass was described in the issue of September 21, 1906.

Roswell Miller, chairman of the board, has been quoted as follows in regard to the Pacific extension:

"The line will be 150 miles shorter from Chicago to Seattle than the

Northern Pacific, and about 80 miles shorter than the Great Northern. Over the mountains the grades will be from 1% per cent. to 1 1/2 per cent. compensated. The Northern Pacific grades are in all cases 2% per cent., and many of them are not compensated, and therefore average as high as 2% per cent. Aside from the mountain grades, the St. Paul will have a much lower grade than the Northern Pacific, and the mountain grades are so bunched that they will not impede traffic. The extension is compelled by physical conditions to run along the Northern Pacific for a considerable distance, and to cross it several times. This, however, does not apply to much territory which produces a large business and therefore the competition will not be severe. The estimated cost of the extension will be \$40,000 a mile for the main line, which includes equipment, and \$30,000 a mile for branches. This contemplates a strictly first-class road in all respects."

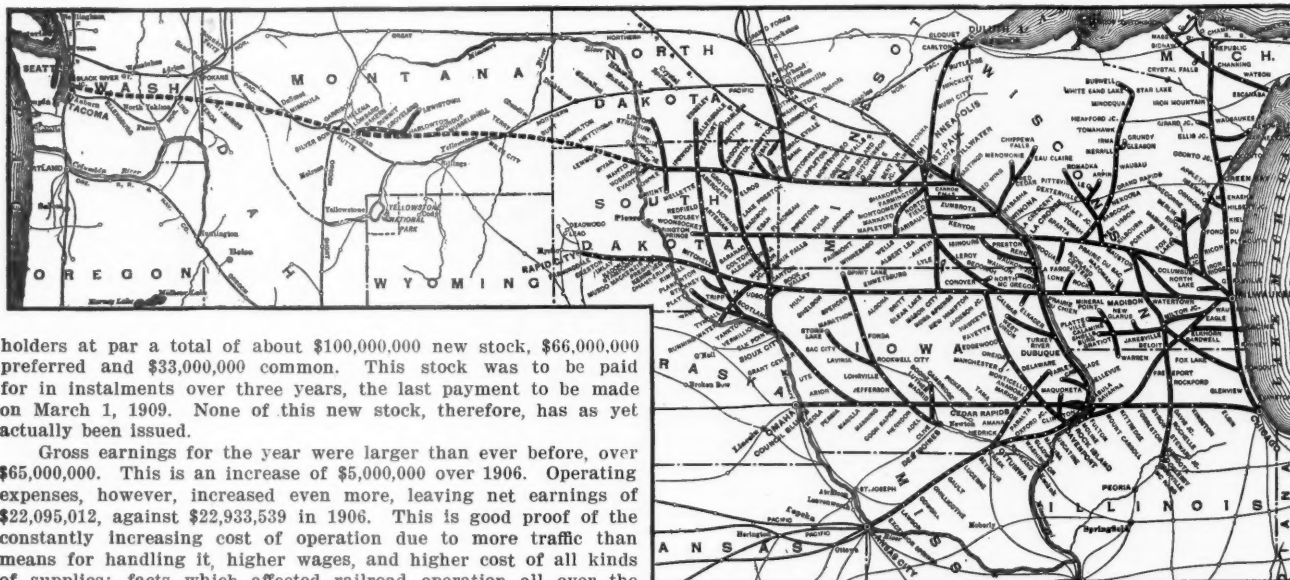
While the fact of the Pacific extension is at last officially recognized in an annual report, the means by which the bulk of the new capital necessary for its construction is being raised—in itself the most important single event in the history of the St. Paul for the past year—is not even hinted at, except as the balance sheet shows a liability of \$24,690,000, representing subscriptions to capital stock. The only new stock issue which is directly mentioned is that of \$25,000,000 common stock made last fall. This amount of new stock had been authorized by the shareholders on October 4, 1902, following a threatened break with the Union Pacific over the division of through rates to the coast. Since that time it had remained in the treasury unissued, suggestive always of the possibility of an extension of the St. Paul to the coast. Twenty-five million dollars, however, is only a small part of the money which will be necessary before the St. Paul has its own through line from Chicago to Puget Sound. Consequently, late in December, there was offered to stock-

holders at par a total of about \$100,000,000 new stock, \$66,000,000 preferred and \$33,000,000 common. This stock was to be paid for in instalments over three years, the last payment to be made on March 1, 1909. None of this new stock, therefore, has as yet actually been issued.

it is a local road with most of its mileage on the prairies, where the cost of track maintenance is at a minimum. With completion of the Pacific extension and the establishment of this as the St. Paul's one dominating through route, the cost of roadway maintenance per mile operated will tend to increase. At present the amount spent appears to be about the minimum with which the property can be kept in proper condition.

Maintenance of equipment stands at \$8,600,000, against \$5,600,000 in 1906, an increase of \$3,000,000, or over 50 per cent. This large increase appears to have been mainly due to the charging of \$3,346,610 to operating expenses for replacement of equipment, against \$694,646 in 1906 and \$682,389 in 1905 similarly charged. The increase in the total expenditures last year on this account is perhaps most strikingly shown in the item "maintenance of equipment per revenue train-mile," which increased from 19.27 cents to 27.99 cents. The increase is also shown when the account is analyzed into its separate units. The cost per locomotive was \$2,548, against \$1,454 in 1906; \$775 per passenger car, against \$663 in 1906, and \$102 per freight car, against \$46 in 1906. The marked increase in the locomotive and freight car items suggests that these classes of equipment have been maintained at a minimum or below during recent years, as well as the tremendous traffic handled during the year. The St. Paul builds more of its locomotives and cars than any other railroad. Improvements to its Milwaukee shops, costing \$652,000, have been made during the year, and at present these shops can turn out 10 locomotives a month and 28 freight cars a day.

Conducting transportation shows an increase of \$3,083,088, or 15 per cent. There were large increases under various heads. The



Chicago, Milwaukee & St. Paul.

Gross earnings for the year were larger than ever before, over \$65,000,000. This is an increase of \$5,000,000 over 1906. Operating expenses, however, increased even more, leaving net earnings of \$22,095,012, against \$22,933,539 in 1906. This is good proof of the constantly increasing cost of operation due to more traffic than means for handling it, higher wages, and higher cost of all kinds of supplies; facts which affected railroad operation all over the country in the late fiscal year.

Freight earnings and revenue freight ton miles each increased about 10 per cent. The principal increases in tonnage were as follows: Flour and other mill products, 168,125 tons; wheat, 71,869 tons; fruit and vegetables, 53,114 tons; bituminous coal, 158,110 tons; iron and other ores, 565,054 tons; stone, sand, etc., 130,704 tons; lumber, lath and shingles, 100,989 tons; petroleum and other oils, 72,252 tons; castings and machinery, 92,154 tons; commodities not specified, 463,159 tons. The only decreases in tonnage were in barley; oats; corn; sash, doors, blinds and other forest products; lime, cement and plaster. Although there was an increase of 6 per cent. in the tonnage of agricultural products as a whole, these comprised a slightly smaller percentage of the total than in the previous year. The St. Paul's traffic, in fact, is so diversified that the company's dependence is not on any one particular product. With the development of the central West the road has become more than a granger line and carries large quantities of manufactures, coal, lumber and general merchandise. The Pacific extension should open up large new traffic areas which will not only furnish large quantities of raw products to be shipped eastbound, but will demand in return the manufactures of other products of the East and central West; in both directions the St. Paul will get a long through haul.

Less was spent on maintenance of way than in the preceding year. Less rails and ties were laid, and less was spent on ordinary roadway maintenance. Per mile of road, maintenance of way cost \$827, against \$856 in 1906. The St. Paul has long been noticeable among the railroads of the country because it spends so little per mile on keeping up its line. The particular reason for this is that it has so large a proportion of branch-line mileage. Taken as a whole,

item, engine and roundhouse men, which increased \$232,000 in 1906, was larger by \$561,000 last year. Fuel and other supplies for locomotives increased \$283,000 in 1906 and \$877,000 in 1907. Train service and supplies increased \$156,000 in 1906 and \$364,725 in 1907. Switchmen, flagmen and watchmen, after rising by \$183,000 a year previous, increased \$269,000 last year. Station service and supplies increased \$260,000 in 1906 and \$324,000 in 1907. Use of cars and locomotives increased, \$125,000 in 1906 and \$152,000 in 1907. This last item shows an increase of nearly 300 per cent. in two years and probably represents the pressing into service of foreign cars to relieve the extreme car shortages.

The St. Paul's new line from Chamberlain, S. Dak., on the Missouri river, to Rapid City, 219 miles, is finished and nearly ready for operation. The Chicago & North-Western, starting from the Missouri river at Pierre, S. Dak., has also been pushing a line to the principal city of the Black Hills district, and the two roads reached their destination at about the same time this summer, thus adding another to the many points at which the St. Paul and North-Western are keen competitors.

Considerable second-track work has been done during the year, as well as reduction of grades at various points on the line. Large improvements of this sort are still necessary to put the existing lines which will be used as the eastern end of the through line to Puget Sound in shape for heavy through traffic. Aside from such general improvements, it is not probable that the St. Paul, with the tremendous project of the Pacific extension on its hands, will undertake any large amount of new building in other directions.

It was, in fact, announced last spring that some \$9,000,000 worth of new extensions and improvements had been indefinitely postponed. In order to carry the new stock issues at the present dividend rates it will be necessary for the Pacific extension to make a strong showing from the first, for the existing lines cannot bear the whole burden alone. It is entirely probable that the extension will do this, in spite of the fact that it is being built at the highest cost of labor and materials ever known. Yet if the earlier transcontinentals were built at a cost nearly as low in some cases as one-half what the St. Paul is paying, they ran through long stretches of country which for years were barren of traffic. To-day enterprise and development in the Northwest are at a maximum. The new country which the St. Paul opens up should be rich in traffic from the start. Such business will be in addition to the developed and profitable through traffic to and from Puget Sound.

The principal results of the last two years' operation are summed up in the following table:

	1907.	1906.
Mileage worked	7,049	6,961
Passenger earnings	\$12,102,196	\$11,123,545
Freight earnings	44,115,059	40,187,710
Gross earnings	60,548,554	55,423,053
Maint. way and structures	5,830,968	5,955,432
Maint. of equipment	8,589,757	5,598,046
Conducting transportation	22,782,468	19,699,381
Operating expenses	38,453,542	32,489,514
Net earnings	22,095,012	22,933,539
Betterments and improvements	1,415,747	4,764,556
Net income	13,988,644	13,323,231
Surplus for the year	5,072,463	7,009,896

CONTRIBUTIONS

Shippers' Organizations to Bargain for Rates.

New York, Sept. 3, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The *Journal of Commerce*, quoting a statement made by Mr. Plant, of the Southern Railway, in the suit against that company by the state of North Carolina, to the effect that "there should be a mutual understanding between the railroads and the public and an equitable arrangement as to rates," says: "This is a new position for railroad men to take, but it is eminently judicious in purpose. Heretofore railroad managers have claimed the right to fix rates for themselves and with sole regard for the interests of the railroads, adjusting them in such a way as to secure the largest return that the conditions of traffic will admit of. State railroad commissions, on the other hand, have been apt to be arbitrary and to assume that rates should be made as low as the traffic will bear without being discontinued by bankruptcy of the roads. If the business is to go on successfully regulation and operation must be brought into amicable relations. Those responsible for the management of railroads must arrange their schedules of rates, but this should be done with the fullest publicity and a complete disclosure of the conditions supposed to justify them."

The editor of the *Journal of Commerce* is right in declaring that the public ought to be represented; yet he ignores the fact, even while referring to it, that the public is represented already—by the state railroad commissions. What is the reason for this? The editor, like the rest of us, evidently is painfully aware that most of the state commissions are of doubtful value to the public. And the trouble is not because the commissions are not devoted to the public. They certainly aim with zeal to stand up for the public as against the railroads—although ostensibly they are independent bodies, of judicial temper, devoted to justice whether justice be for or against the railroads. No; the weakness of the commissions is due to their ignorance and their mistaken political zeal.

Mr. Plant's suggestion should not fall to the ground however, notwithstanding this blind and one-sided attitude of the present representatives of the public. The public which deals with the railroads—that is to say, the shippers—might well appoint representatives of its own. Probably the most satisfactory arrangement for carrying on negotiations between railroads and shippers that has ever been tried was that established through the traffic bureaus, such as were quite popular in St. Louis and certain other cities some 15 years ago, and which still continue to give efficient service in some places. It is only repeating an elementary truth to say that the "authority" who deals with the railroads on behalf of shippers, should, first, know accurately and in detail the needs and desires of the people whom he represents, and, secondly, should be enthusiastically devoted to the interests of these people. The average state railroad commissioner is enthusiastically devoted to those voters or the representatives of those voters who, he believes, will rule at the next election. It might be well even to go so far as to have boards of trade incorporated, and perhaps given some semblance of authority. That would be better than to continue our present farcical arrangements. Even in such a situation as that of the present year in Kansas where the railroads and the state commissioners reached a compromise on freight rates, there still

seems to be a sad lack of harmonious purpose. The need of the day is a railroad commission of strong business men. Farmers, politicians and country lawyers should be kept in the rear.

I want to say a word also for the railroads. The *Journal of Commerce* in proposing that the freight traffic manager, in fixing his rates, shall make "complete disclosure" of the conditions on which he bases his decisions is quite superficial. This is an idea that can never be put in practice. To even approximate a full understanding between the railroad and the public as to the reasons for a 10 per cent. increase in the rate on an important commodity, it would be necessary to hold a six days' public debate. Only by prolonged discussion would it be possible to settle the difference between the freight agent's estimate of the conditions and the estimate supported by the other side.

The only feasible way to make freight rates, in most cases, is by bargaining. The railroads must be allowed—at least in the beginning—to proceed on the theory of what the traffic will bear. The soundness of this theory is not shaken by the fact that it has often been abused by shortsighted traffic managers. It is proper for the public to see that the traffic manager does not punish traffic by charging it what it will not bear; but restraint of an overzealous freight agent is far different from cutting his head off. Anyone who tries to reverse the true theory of rate making only stultifies himself. "Complete disclosure" of conditions is a good goal at which to aim, and shippers may rightfully be on their guard constantly against unnecessary concealment by the railroads; but the theorist must deal with conditions as he finds them. Even state operated railroads are obliged to ride rough shod over his theories.

PROFESSOR.

Safety at Crossings Without Whistling.

Philadelphia, Pa., Sept. 16, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have just read with interest your editorial of last week on the Noise Nuisance. Many sensitive railroad men as well as thousands of sensitive passengers will endorse your denunciation of the loud whistle and the careless engineman. You might well have gone more fully into particulars. One of the most useless functions of the locomotive whistle is the regular enforcement of the rule regarding whistling for highway crossings, where such crossings are guarded by a flagman and in many cases by both flagman and gates. This unnecessary practice is observable in many places; and it appears to be kept up in spite of the fact—not in ignorance of it—that at hundreds of crossings in this country and Europe a saner practice prevails. On the New York, New Haven & Hartford many years ago an order was issued that where crossings were provided with attendants, the whistle need not be sounded. The attendants probably in most cases had in their cabins electric bells warning them of the approach of trains. On the Boston & Albany as much as 30 years ago, whistling was abandoned at crossings which were watched, as well as at many others also. At that time many of the gatemen's cabins had no electrical connection. An officer of the legal department of that road said in substance that the disuse of the whistle at these crossings had not increased the company's burden of expense either by adverse rulings of the judges in law suits, or by added severity in the awarding of damages by juries. The notion that every time a railroad relaxes its precautions at highway crossings even a hair's breadth, it incurs new dangers in the courts, is imaginary.

There are many highway grade crossings in England, a common American impression to the contrary notwithstanding; and the whistle nuisance has been done away with in that country long since, if, indeed, it ever existed to the barbarous extent which obtains in this country.

Why should not our ideas of whistling be reversed? Why not begin with the presumption that in ordinary circumstances whistles are not needed; that they should be used only by order or permission of municipal authorities? Why do cities and towns allow unrestrained use of locomotive steam whistles for calling in flagmen, for giving switching signals in large yards, and for other things of secondary importance, when hand bells or small mouth whistles or hand motions would answer just exactly as well? It is to be confessed that town officials are negligent in matters of this kind, perhaps as generally as are railroad superintendents, but in the universal apathy of railroad officers, it might be a good thing to stir up the municipal authorities.

G. F. M.

A Few Phases of Railroad Science.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There never was a time in the history of railroading when so many people were coming forward to explain why this difficulty existed, and how that trouble could be eliminated if only the other fellow would do so and so. Some of these are instructive, some amusing, and some are neither.

Why we are getting this flood of explanation is of course quite

plain. It is simply because the troubles exist, and so far all the explanations offered have not reduced one trouble, nor have the suggested remedies, with one or two exceptions, been worth the time it took to write them. The exception par excellence is, of course, that of James J. Hill, and when his words are carefully considered and stripped to the bone they amount to simply this. The railroads of America that are in trouble must get busy and spend money, spend lots of it and spend it right. The people who put in their time offering other remedies are like the wild turkey in the trap, they go doddering around looking for a hole where there is none but will not get down and use the only opening that exists.

That this remedy should be unpopular goes without saying, but the fact must be recognized sooner or later that the art of making bricks without straw went out about the time the children of Israel followed Moses out of Egypt. Corporations as well as individuals when they find themselves in trouble can look back and see where they have been doing something wrong, and the sin of the railroads has been the heart breaking race for the prize of a larger "net increase over the same period last year." The object in itself is all right, but the mistake has been in the foolish idea that too great a proportion of this increase was theirs to salt away and keep. It was not, and now they must go back and dig it up again, or if it is gone beyond reach mortgage their future that they may have a future. And the one that does this first will win out first.

The science of railroading like some others is not an exact science. It is still lop-sided and has many anomalies. For instance, while the country as a whole has been advancing by leaps and bounds, business increasing in all directions, and the "net increase over same period last year" has steadily grown, what do we find in the detail of the railroad service? While the car service man is sending in nice little essays on the car situation, cars are standing out of service waiting repairs. The real car man, the man who actually keeps them in condition to be moved, is told to go ahead and rush them out, but do not exceed your expenditure for the same period last year. While loaded cars and empties are waiting to be shunted the yardmaster is howled at by the trainmaster to get a move on and do the work, but do not exceed your expenditure for the same period last year. While the trainmaster is explaining that he cannot move trains without engines, the motive power man is screamed at to get out the locomotives and keep them in good repair, but do not exceed your expenditure for the same period last year. The roadmaster is explaining that he cannot get men to work at the old rates, he is told to go ahead and do the work, but do not exceed your expenditure for the same period last year. The superintendent is explaining that the volume of business has outgrown his facilities, that he can no longer handle a traffic that has increased 100 per cent. while his trackage, etc., has increased 10 per cent., or not at all, but he gets the same song, with variations, and the farce goes merrily on.

Never mind that some of the cars are getting older every year, and there are many more of them. Don't take into account that the locomotives are each year more expensive to keep in running order, and the man we pay \$2 to to-day is not doing the work a \$1.75 man did before. Don't acknowledge that your rails are one year older, that your roadbed requires more labor as your ballast wears thin, shut your eyes to the fact that anywhere off your road the section men can get better pay than you offer. Don't see all, or any of these things, let them all stand still while we make up our "net increase over same period last year." But don't stand still too long, for things that move have a way of running over things that stand still, and there is a pretty general break in the line and a scramble for money. Will the supply be equal to the demand?

Our diagnoses of the evils that afflict us are often wrong, and it follows that the remedies applied are useless. At a meeting of a railroad club some weeks ago the head of the passenger and ticket department read a paper that was very good indeed, and he covered so much ground that by the time he got through you had the feeling that he must surely be the Alpha and Omega of all railroading. While the members were throwing bouquets at him one gentleman during his congratulatory speech told a little story on the side. In this story there was a fat passenger who complained of the dust in the car, the heating appliances, and finally he cursed the whole outfit on account of being jolted by the engine driver's rough handling of the train. The gentleman who told the story had been in the car with the grumbler, but whether he told the yarn to simply amuse the members of the club, or whether he intended it as a gentle hint to the passenger man that he was not the whole thing I cannot say. I do not even know how it struck the company generally, but it sounded good to me. Here was a passenger who might be taken as a fair sample of 95 per cent. of all the passengers who traveled on this road. He knew nothing about the head of the passenger department, he was not interested in the man who sold him his tickets, nor did he care a red cent for the conductor, but he had a grievance against the motive power department through the engineer who had jolted him, and against the car department for his other ills, and if he continued

to patronize the road or left it for a rival they and they alone would be responsible.

Here was food for thought surely. It was not a new thought to me but brushed up some old ones. Now how many passengers who might travel by a rival line is the passenger department solely responsible for securing and keeping for their own road? I have traveled on railroad trains for 20 years, meeting all sorts and conditions of passengers, and I am prepared to say they are very few. That the passenger department does secure a small number goes without saying, but as for keeping them they have less than nothing to do with it. A passenger man may induce a man, or number of men, to travel by his road once, but if the cars are dirty, the road rough, and the train badly handled he can't get him again, and these are items he has nothing to do with. While if none of these exist, if the cars are right, the road smooth and the train well handled these will attract the passenger in the first place, becoming known to him through that best advertising medium in the world, a satisfied patron, and they will keep him though he never heard of the passenger department or its representatives. And the thought in my mind is was this what the gentleman meant when he told his little story? This may appear somewhat insipid, but it leads us to one more phase of the science of railroading, and how it works out in detail at the present day.

Take any of the railroads where they enter a large city, and let us visit the roundhouse and shops where the locomotives are cared for, and the men to run them are trained, with all that both these employ, and there we will find a man in charge who bears the title of, we will say, master mechanic. Now who is he and what training was necessary for his position? Here is his history: After receiving a good common school education he enters a railroad shop and by constant hard work, honesty, sobriety and much more than average ability, he has risen step by step during 20, 25 or maybe 30 years to the position he now holds. And to fill that position he requires all the knowledge and experience he has gained during a term of years that would have turned him out a lawyer, a doctor or two or three more of the learned professions. And what is his work like? Well, we have no space for a detailed account of that, but we might say he is simply chained to the wheels of the locomotives under his charge, and they never stop rolling, Sunday, Monday, night and day they go on and he must follow. His day is an emergency, and his night is as restful as that of a doctor with a good practise. All his hard earned knowledge and experience fails him at times and he is thrown back on that mother wit that was his only capital to start with, but there is one thing he must not do, and that is to fail, not for a day, not for an hour; there is too much depending on him for that.

Well, a short life and a busy one for him, and so long as he is well paid he has no kick, but is he? A short distance away from him in the same city we find a young man in charge of the same company's ticket office. Who is he, and what was the training necessary to enable him to fill his position? We find he breaks even with the master mechanic at the time they both leave school. But he goes into a comfortable office from 9 to 5 each day and learns to fill in forms and require a good knowledge of time cards. In a year's time he is as fit as ever he will be to fill the position he now holds, but he is too young, so we will give him five years, during which time he has lived soft and had time and opportunity to enjoy life. And now we find him in his snug little job where he must sell tickets, answer questions, and send in his reports. When he can he extends the passenger business of his road, but we have seen that he hasn't really much to do with that.

Now which one of these men is most considered by the railroad employing them, and which one receives the greater money consideration from their respective positions? The ticket agent!

I have used the master mechanic as an illustration for the reason that his salary comes the nearest to being equal to that of the ticket agent, but the same thing or more may be said of the roadmaster, the trainmaster, the car foreman, the general shop foreman, the roundhouse foreman and many others, but these hard-working unfortunates are so far behind the passenger department man in all that makes life worth living, and especially in the matter of salary and pickings, that the comparison would be odious, but, odious or not, let us look at one more. The roundhouse or locomotive foreman. He has charge of the care and despatching of the locomotives that do the work of the railroad, of the mechanics who repair them, the cleaners who wipe them and the firemen and engineers who run them. To do this he should be a mechanic for he must decide as to whether an engine is fit to continue running without more than light over night repairs. He should know more than the men under him of the business in hand as he must direct these men, and decide what each shall do. What engineer shall take this run and what fireman is best fitted for that engine, etc. Then it is he who must despatch these engines each day for yard service, extra and regular freight trains and passenger trains. So that he is really responsible if the fast express does not leave on time, if the freights are delayed in starting and if the yard crews have to wait on their engine.

Now this would seem to be a rather important position and the man who fills it worthy of consideration and encouragement. But what are the facts. On nearly all the railroads in America this man is paid about 60 per cent. of what the engineer is paid, and about 85 per cent. of what the fireman receives for his work. Yet he is "over" these men, he is expected to keep them up to the mark, to "jolly them along" to maintain discipline and obtain results generally. With such object lessons as the foregoing before them, young men of common sense and the ability that would carry them through the long years of training necessary to fit them for the positions of master mechanic, shop foreman, etc., are not entering that branch of the service, and small blame to them.

The condition is not a natural one, and for that reason must pass away, but it will cost the railroads of America much money in passing. It is largely in their own hands to say how much, by applying the old principle that a stitch in time saves nine.

Let us just glance at this again. Suppose we go out looking for material to be worked into—item, one master mechanic; item, one ticket agent. We find two young men of 23 years of age; smart, bright young fellows both, with about the same amount of natural ability, and the same education. We take them in hand and we turn out our passenger man fully equipped for his duties in three years, and 20 years later we begin to look for our master mechanic to chip his shell and give us an idea of what he can do. Now if it takes 20 years to make a master mechanic, or a man thoroughly competent to keep in serviceable condition so important a part of a railroad equipment as the locomotive, there should be some encouragement offered for men to enter that branch so that the supply may not run out.

As I said before, I only use the position of master mechanic as an illustration; the same thing applies to the man who has charge of the balance of the rolling stock, and to the man who is responsible for the condition of the permanent way.

Never in the history of railroading on this continent have there been so many accidents due to the failure of equipment as at present. There has been volumes written on the few important accidents that were attributable to a failure of that complex piece of machinery, the brain of man, but what do they amount to, compared to the number due to failure of locomotives, cars and track? I am not speaking now only of the accidents where human life is lost, and that appear in our little table of statistics, but to the hundreds that do not appear there, but are nevertheless eating the heart out of the railroads, and could be so largely prevented by the expenditure of money in inspection, repairs and maintenance. And this brings us back to Mr. Hill's text: Get busy and spend money, and spend it right, and don't forget the human element. The railroad that is the last to increase the pay of its employees is the one that will be left behind in the race; eventually it must pay the price, but it will find itself paying it to the culls, while the other fellow has the good men. That "net increase over the same period last year" may suffer a little for a short time, but it will grow stronger and better with a much more healthy growth in the future.

In North America 30 years ago there were two great railroads growing, and fighting each other step by step whenever they came within striking distance, and between rounds they swatted all the smaller roads that even cheeped in the shell. And this in a vast country whose progress was even then retarded for want of further railroad extension. Year by year since that time they have carried on the war while the country has advanced so rapidly that while one of them was spending hundreds of thousands of dollars to prevent a new road cutting into what they considered their own particular territory, their own line was blocked with a congestion of the very traffic they wanted to prevent the new road getting a portion of, and after it was through they were so busy trying to keep up with the natural increase in their own business they had no time to find out whether the other fellow got any business or not. Now if railroading was an exact science here was an object lesson that might sink into the mind, but did it? Oh no! As soon as they get through throwing money away in that little fire they see another and rush to smother it with good, real money. In all the history of this 30 years war I cannot find that the money spent and the effort put forth has ever resulted in one dollar's worth of benefit to the side spending it, nor that it has been effectual in doing more than very slightly checking the country's advance, and that is after all what they were trying to do, though in all justice to them we must acknowledge they did not know it, nor do they yet.

I have never forgotten that incident in the life of David Livingstone, the explorer, where the dogs are turned loose to pursue the lion, but instead of trying to do the work for which they had been raised and fed they "went to fighting among themselves"—and how as a child I did hate those dogs! The same feelings are finding expression to-day among the grown-ups, in the appointments by the various governments of railroad commissions, and the future will show us whether or not this is the panacea we have been looking for. Personally I feel that it is not, but it is nevertheless the best that can be done until such time as the old generation shall have passed away, and newer and more enlightened counsels shall pre-

vail among the railroads themselves. When the anomalies in the details of the service shall be hunted out, more attention given to vital principles, wasted energy directed into legitimate channels and the science of railroading be brought to the point where it may more nearly approximate an exact science.

E. J. M.

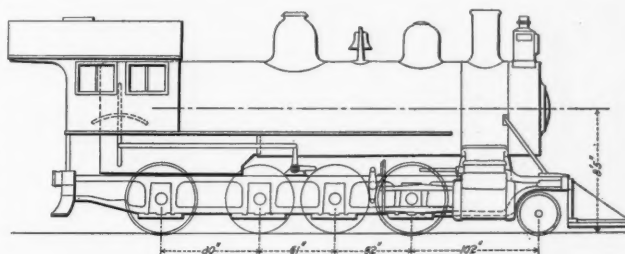
Pressure of Locomotive Wheels Against the Rails.

BY GEO. L. FOWLER,

Associate Editor of the *Railroad Gazette*.

There has been some discussion in the *Railroad Gazette* during the past year (see especially the issues of March 15 and March 23) regarding the stresses that the wheels of cars and locomotives exert on the track on curves of various radii. In the issue of March 23, the results of calculations for New York Central electric and Atlantic locomotives were given. On a 3 deg. 5 min. curve it was estimated that the lateral thrust against the rail exerted by the leading truck wheel of the electric locomotive was 6,410 lbs. at 40 miles an hour and by the leading driver 4,740 lbs. For the Atlantic locomotive at the same speed the lateral thrust of the leading truck wheel was estimated at 7,830 lbs. and the leading driver at 6,260 lbs., the speeds being the same. The weights on the wheels were 26,000 lbs. on the truck wheels, and 34,250 lbs. on the drivers of the electric locomotive; and 21,250 lbs. and 52,500 lbs. on the truck and driver wheels of the Atlantic engine respectively.

I have recently been investigating the lateral stresses imposed by car wheels on curves and am led to believe that the calculated



Outline of H4a Consolidation Locomotive; Pennsylvania Lines West.

stresses mentioned above are too low. In this investigation an H4a locomotive of the Pennsylvania Lines West was used to accelerate the car used in making the tests, and incidentally I obtained a number of digrams of the lateral wheel stresses of this engine, one of which is shown herewith. The speed at which this was taken was 30.61 miles per hour and the place was on the outer rail of a curve of 4 deg. 25 min., with a superelevation of the outer rail of 3% in., corresponding to a speed of 36.66 miles an hour. The engine was of the consolidation type, with the following distribution of weight and a wheel arrangement spaced in accordance with the dimensions given on the accompanying engraving.

Total weight of engine.....	174,300 lbs.
Weight on truck wheel.....	18,200 "
" first driving wheel	36,400 "
" second "	39,800 "
" third "	40,100 "
" fourth "	39,800 "

The lateral thrust as weighed by the track instrument was for the

Truck wheel	13,430 lbs.
First driving wheel.....	11,450 "
Second "	13,000 "
Third "	12,215 "
Fourth "	11,170 "

I have no comment to make on this other than to say that, as the purpose of the investigation was not to ascertain track stresses for locomotives, no examination was made of the engine to determine the amount of play in the bearings, flange play or any of the other elements that would affect the results.

Attention is called to the fact that the thrust was greatest on the front truck wheel and that there was a decided falling off at the first driver. The second driver followed with a pressure nearly equal to that of the truck wheel, and the last two driving wheel pressures were decreasing quantities.

When the engine was running backward the rear driver exerted a heavier pressure than did the truck wheel when running forward at the same speed.

The work on cars has led to the conclusion that only a long series of carefully conducted experiments will make it possible to evolve the law governing these pressures, as a momentary change in the adjustment of the moving parts with relation to each other will have a measureable effect. And, further, these diagrams that were made by a very sensitive and carefully calibrated apparatus, indicate that the calculations based upon the usual hypotheses give results that are too low for average working conditions, though a

peculiar and momentary position of the moving vehicle or engine may cut them down below that called for by the calculations as the pressures evidently vary from instant to instant between wide limits.

In explanation of the sudden rise in pressure shown on the diagram after the passage of the first driver it should be said that

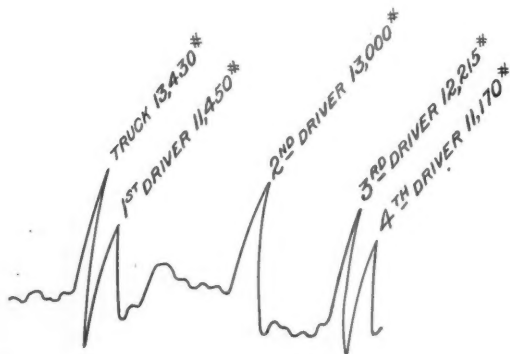


Diagram of Lateral Thrust of H4a Locomotive on $4\frac{1}{2}^\circ$ Curve at 30.61 Miles Per Hour.

the initial pressure on the apparatus was accidentally raised just at that instant by a slight movement of the pressure pump which was being used to regulate a small leak in the hydraulic recording apparatus.

Railroad Statistics of the United States for Year Ended June 30, 1906.

The Interstate Commerce Commission has issued an advance abstract of its annual report for the year which ended 15 months ago, from which the principal items are shown in the table below. The preliminary report for the year under review was given in the *Railroad Gazette* November 30, 1906.

Railroad Statistics for Years Ending June 30.

	1906.	1905.	1904.	1903.	1902.
Miles complete	224,363	218,101	213,904	207,977	202,472
Increase, 12 months....	6,262	4,197	5,927	5,505	5,234
In hands of receivers....	3,971	796	1,323	1,185	1,475
Locomotives, No.	51,672	48,357	46,743	43,871	41,228
Cars, owned, passenger ..	42,262	40,713	39,752	38,140	36,991
Cars owned, freight	1,837,914	1,731,409	1,692,194	1,653,782	1,546,132
Cars owned, total	1,958,912	1,842,871	1,798,561	1,753,389	1,640,229
Employees	1,521,355	1,382,196	1,296,121	1,312,537	1,189,315
Per 100 miles of road..	689	637	611	639	594
Total stock and funded debt in millions....	\$14,570.4	\$13,805.3	\$13,213.1	\$12,600.0	\$12,134.2
Stock & debt pr mile road	67,936.0	65,926.0	64,265.0	63,186.0	62,301.0
Gross earnings, millions..	2,325.8	2,082.5	1,975.1	1,900.1	1,726.4
Average per mile	10,460.0	9,598.0	9,306.0	9,258.0	8,625.0
Passengers carried, millions	800.0	738.8	715.4	694.9	649.9
Carried 1 mile, millions	25,175.5	23,800.1	21,923.2	20,915.8	19,690.0
Tons freight car'd, millions	1,631.4	1,427.7	1,309.9	1,304.4	1,200.3
Carried 1 mile, millions	215,877.6	186,463.1	174,522.1	173,221.3	157,289.4
Av. rate per ton-mile, mills	7.5	7.7	7.8	7.6	7.6
Av. pass. fare pr mile, cts	2.0	2.0	2.0	2.0	2.0

Examining the totals for the year 1906 more in detail the following items will be found of interest:

An increase in mileage exceeding 100 miles appears for 26 states and territories (17 a year ago). The operated mileage for which returns were made was 222,340.30 miles, including 7,865.97 miles of line used under trackage rights. The aggregate length of tracks of all kinds was 317,083.19 miles, classified thus: First main track, 222,340.30 miles, as just mentioned; second track, 17,936.25 miles; third track, 1,766.07 miles; fourth track, 1,279.66 miles, and yard track and sidings, 73,760.91 miles.

The number of corporations reporting was 2,313. During the year companies owning 4,054.46 miles of line were reorganized, merged or consolidated. The corresponding figure for the year 1905 was 3,802.02 miles for the year ending June 30, 1906, the mileage of roads operated by receivers was 3,971.43 miles, or an increase of 3,175.61 miles as compared with 1905. The number of roads in the hands of receivers was 34.

The locomotives, excepting 1,090, were classified as: Passenger, 12,249; freight, 29,848, and switching, 8,485.

The cars were thus assigned: Passenger service, 42,262; freight service, 1,837,914, and company's service, 78,736.

The average number of locomotives per 1,000 miles of line was 232, and the average number of cars per 1,000 miles of line was 8,810. The number of passenger-miles per passenger locomotive was 2,055,309, showing an increase of 6,751 miles as compared with the previous year. The number of ton-miles per freight locomotive was 7,232,563, showing an increase of 541,863 miles.

Of the capital outstanding, \$14,570,421,478, there existed as stock \$6,803,760,093, of which \$5,403,001,962 was common and \$1,400,758,131 preferred; the remaining part, \$7,766,661,385, represented funded debt, consisting of mortgage bonds, \$6,266,770,962; miscel-

laneous obligations, \$973,647,924; income bonds, \$301,523,400, and equipment trust obligations, \$224,719,099.

Of the total capital stock outstanding 33.46 per cent. paid no dividends. The amount of dividends declared during the year was \$272,795,974, being equivalent to 6.03 per cent. on dividend-paying stock. For the year ending June 30, 1905, the amount of dividends declared was \$237,964,482. The total amount of funded debt (omitting equipment trust obligations) that paid no interest was \$287,954,851, or 3.82 per cent. Of the total amount of stock outstanding \$2,257,175,799 were reported as owned by railroad corporations, and of railroad bonds \$641,305,030 were so reported.

The number of tons of freight carried one mile per mile of line was 582,401, indicating an increase in the density of freight traffic of 121,005 ton-miles per mile of line.

The average revenue per passenger per mile for the year carried out to three decimals was 2.002 cents. For the preceding year the average was 1.962 cents. The ratio of operating expenses to earnings for the year 1906 was 66.08 per cent.; for 1905, 66.78 per cent.

Gross earnings \$2,325,765,167, were \$243,282,761 greater than for the year 1905. Operating expenses (\$1,536,877,271) were \$146,275,119 more than in 1905. The gross earnings in detail were: Passenger revenue, \$510,032,583—Increase, \$37,337,851; mail, \$47,371,453—Increase, \$1,945,328; express, \$51,010,930—Increase, \$5,861,775; other earnings from passenger service, \$11,314,237—Increase, \$274,095; freight revenue, \$1,640,386,655—Increase, \$189,613,817; other earnings from freight service, \$5,645,222—Increase, \$564,956; other earnings from operation, including unclassified items, \$60,004,087—Increase, \$7,684,939.

The operating expenses assigned to the four general classes were: Maintenance of way, \$311,720,820; maintenance of equipment, \$328,554,658; conducting transportation, \$836,202,707; general expenses, \$59,752,230; undistributed, \$646,856. Operating expenses averaged \$6,912 per mile of line; increase \$503 per mile.

The income from operation (net earnings) was \$788,887,896; increase \$97,007,642. The net earnings per mile of line for 1906 averaged \$3,548; for 1905, \$3,189, and for 1904, \$2,998. The amount of "other" income was \$256,639,591, including income from lease of road, \$119,604,619; dividends on stocks owned, \$66,861,656; interest on bonds owned, \$20,537,011, and miscellaneous income, \$49,636,305. The total income of the railroads (\$1,045,527,487)—that is, the net earnings and income from lease, investments and miscellaneous sources—is the amount from which fixed and other charges against income are taken to ascertain the sum available for dividends. Such deductions aggregated \$660,341,159, thus leaving \$385,186,328 as the net income for the year ending June 30, 1906, available for dividends or surplus.

The amount of dividends declared was \$272,851,567, leaving as the surplus from the operations of the year \$112,334,761. The figures for income and expenditures are compiled from the annual reports of leased roads as well as of operating roads, and thus necessarily include duplications in certain items.

The total number of casualties to persons was 108,324, 10,618 killed and 97,706 injured. These figures include the casualties to persons trespassing, of whom 5,381 were killed and 5,927 were injured. The total number of casualties to persons other than employees from being struck by trains, locomotives or cars was 5,127 killed and 4,905 injured. With regard to trainmen—that is, engineers, firemen, conductors and other trainmen—it appears that one trainman was killed for every 124 employed and one was injured for every eight employed. With respect to the number of miles traveled, the figures for 1906 show that 70,126,686 passenger-miles were accomplished for each passenger killed, and 2,338,859 passenger-miles for each passenger injured. For 1905 the figures were 44,320,576 passenger-miles for each passenger killed, and 2,276,002 passenger-miles for each passenger injured. Other details of casualties have been reported in the quarterly bulletins, which have been published in the *Railroad Gazette*.

Die Work.

In a paper before the convention of the Master Blacksmiths' Association, G. H. Steward stated that the use of dies for forming pieces that would formerly have been made by hand had grown to great proportions. Citing the practice of the Altoona shops of the Pennsylvania Railroad, he said that they now have complete sets of dies and formers for steel car work and are using them on the bulldozer for making all parts of steel passenger, baggage, mail and dining cars from the deck moulding at the top to the trucks, excluding the welding of the rods and similar parts. The cost at first was high, owing to the dies being charged to the first lot of cars; but now the work can be done for one-tenth what it would cost to do it by hand, and better results are obtained. In all there are 1,054 dies in use at this place for the different pieces that are formed.

As for the material from which the dies should be made, it has been found that, usually, cast-iron is the best. But where they are to be used under the drop hammer or where a sharp corner is to be formed it will be found to be necessary to use cast-steel for the

purpose as cast-iron will not be strong enough to withstand the strain. In this, as in all other matters, good judgment must be used in order to secure the best results.

In constructing dies for hot work, especially for pressing, it is well to use plenty of material, so as to have them of sufficient strength, as there is a loss of both time and money when a die breaks at a weak point.

It is also good practice to core out dies that are to be used for large work, as this serves not only to reduce the weight, but forms air chambers that will materially assist in keeping the back part cool besides giving an opportunity to circulate water through the casting if it is required, as unsatisfactory results have sometimes been obtained when the die has expanded under the influence of the heat.

Progress on the Western End of the St. Paul's Pacific Extension.

Nearly all of the preliminary work connected with the driving of the new 8,000-ft. tunnel through the main range of the Bitter Root mountains on the Pacific coast extension of the Chicago, Milwaukee & St. Paul has been completed. The location through this district has been finally settled and a few hundred feet of the tunnel have already been driven. This, together with the preliminary work noted above, constitutes the progress made on this section of the line during the past summer. Thus, briefly stated, this does not look like much, but in reality it amounts to considerable. The work preliminary to active operations in the tunnel involved the



Unfinished Grade on the St. Joseph River.

perfection of a large organization and the installation of considerable heavy machinery at a point several miles distant from any present railroad connection. With this now accomplished the contractors, Winston Brothers Company, expect that progress on the tunnel will be rapid.

Along the St. Joseph river from Ferrel, Idaho, to Lake Chatcolet the line is about one-tenth completed. During the summer all of the right-of-way has been cleared and all the heavy cuts have been opened; also considerable light grading in the vicinity of St. Joe and St. Maries has been finished. The heavy cut through the village of St. Maries is just being opened by steam shovel.

The specifications for the main line call for a 0.3 per cent. maximum grade and 3 deg. maximum curves, but along the river between St. Joe and St. Maries considerable temporary line, with some 10 deg. curve, is being built. This line is a detour around a hill which will eventually be pierced by a tunnel. This tunnel will be through solid rock all the way and the temporary track around it is being built with the intention of having trains in operation by the spring of 1909, some time before the tunnel could be finished.

Two locating parties are now engaged in locating a branch from St. Maries up the St. Maries valley, through Santa, Idaho, and thence over the divide into the Palouse wheat country. This will be the first branch to be built on the western extension and will tap some of the richest timber land in Idaho.

It is now generally admitted, even by officers of the company, that trains will be operated by electricity from the eastern end of the big Bitter Root tunnel westward for about 100 miles down the St. Joe valley and through eastern Washington to some point west of Tekoa, to be determined later. This will probably be the first stretch of transcontinental trunk line in the country to be operated



The Village of St. Maries, Idaho.

by electricity. The power will be obtained from the St. Joseph river between Ferrel and North Fork. The flowage rights have already been secured; during the summer the surveys for the location of the dams were completed. Plans are now being drawn and active work will commence in the immediate future.

It is proposed to build 11 dams across the river, varying in height from 20 to 75 ft. The total development will be 180,000 h.p.,



Cross Sectioning on Cliff Along St. Joseph's River.

making it one of the biggest hydro-electric propositions in the West. This amount of power will be considerably in excess of the requirements of the railroad and to dispose of the residue high tension transmission lines are to be built to Spokane and also to the Coeur d'Alene mining district in the vicinity of Wallace, Idaho.

The main line of the new road goes through Tekoa, Wash., 35

miles south of Spokane. Up to the present no official announcement of any arrangements for running trains into Spokane has been made. The prevailing opinion in the vicinity is that the St. Paul will use the tracks of the Spokane & Inland Empire Railroad (electric) between Tekoa and Spokane; it is inconceivable that no arrangement will be made for entering the metropolis of eastern Washington.

Progress during the summer between Tekoa and Ellensburg, Wash., has been made more rapid than in Idaho. Considerable of the grade has been finished, probably 35 per cent. Between Ellensburg and the Cascade tunnel the work is in a much more advanced stage. Miles of line, including the trestles, have been finished. Considerable progress has been made on the steel bridges. Easton, near the eastern end of the tunnel, will be made a division point.

The situation at the Cascade tunnel is about like that at the Bitter Root tunnel. The preliminary work of organization and installation of machinery was completed during the summer and the bore has been well started. It is probable that a temporary line will be built over the divide so that trains may be operated previous to the completion of the tunnel.

Between the tunnel and Seattle the line is nearly finished and it is possible that the track will be laid this winter. Work on the grade between Seattle and Tacoma has been actively pushed all summer and will soon be finished. But little terminal work has been done either in Seattle or Tacoma. Roughly speaking, the line between Puget Sound and the Columbia river is 50 per cent. nearer completion this fall than is that portion between the Columbia river and Butte. It has been announced that the line from Seattle to eastern Washington, using the temporary switch-back over the Cascade divide, will be in operation in time for the next year's eastern Washington wheat crop.

July Railroad Law.

The following abstracts cover the principal cases decided in the federal courts during July:

Joint liability between connecting carriers.—The mere fact that the destination of a shipment received by a railroad company for transportation is beyond its own line or that it was received from another railroad company to be transported to a point on its own line does not create any joint responsibility between the two railroad companies where the shipment over each line is under a separate contract which limits its liability for loss or injuries to such as may occur on its own line. *McGuire v. Great Northern Railway Co.*, 153 Fed. Rep. 434.

Duty to provide safe place for work.—Though it is the general rule that a master is to provide a safe place for an employee to work, there are many qualifications of the rule. Thus it is held that the jacking up of the end of a railroad car for the purpose of repairing the trucks is an exception. Work of this character is a part of the duty of the servants making the repairs and there can be no recovery against the railroad company for an injury resulting to a fellow servant from their negligence in doing the work if the appliances were sufficient. *Moit v. Illinois Central Railroad Co.*, 153 Fed. Rep. 354.

Adverse possession of land grant lands.—The Supreme Court decides that a railroad company which has complied with all the terms of a congressional land grant as fixed by Congress and by the act of the state legislature after the acceptance of the grant has such title to lands within the place limits of the grant that title by adverse possession may be acquired by an occupant though a final certificate and patent have not been issued. *Iowa Railroad Land Co. v. Blumer*, 27 Sup. Ct. 709.

Remedy for unreasonable interstate rate.—The rule that an action at law to recover excessive interstate freight charges cannot be maintained until the commission has acted on the question will not prevent a federal court which has suspended a proceeding of this character, pending action by the commission, from granting relief as a court of equity, on a petition filed after the commission has acted, stating in substance the commission's findings and report, and this more especially where the carrier through its attorneys has stipulated in open court that a decree of restitution might be made in case the finding was in favor of plaintiff. *Southern Railway Co. v. Tift*, 27 Sup. Ct. 709.

Reasonableness of rates.—The mere fact that an interstate rate has been duly published and filed by a carrier with the Interstate Commerce Commission is insufficient to raise the presumption in law that the rate is reasonable. In testing the reasonableness of an increased freight rate the expenditures of the carrier for permanent improvements should not be charged to the current or operating expenses of a single year. *Illinois Central Railroad Co. v. Interstate Commerce Commission*, 27 Sup. Ct. 700.

Duty of employees to observe rules.—Where the rules for guidance of an engineer or other employee in given circumstances are plain and unambiguous and have been assented to by the employee, his failure to observe such rules or his disobedience of them at a

time when he is capable of observing them is negligence as a matter of law and will prevent a recovery of damages for his injuries resulting therefrom. The rule was applied in a case where an engineer approaching a switch which was not protected by signals, took his chances of passing it in safety at a high rate of speed in violation of his rules and was injured. *St. Louis & San Francisco Railroad Co. v. Dewees*, 153 Fed. Rep. 56.

Assumption of risk by brakeman.—A brakeman riding on cars and looking toward the rear of the train was injured by striking the eaves of a building which projected slightly over the track. The eaves had been in this position for over 15 years, during which time no accident had occurred. There was ample room on the top of the car for the brakeman to perform all his duties without incurring any danger from the eaves and the brakeman was fully informed as to the position and location of the eaves. The court held that the danger was an open and visible one and was assumed by the brakeman and he could not recover damages for his injuries. *Southern Railway Co. v. Carr*, 153 Fed. Rep. 106.

Abandonment of right of way.—A railroad company wrongfully holding a right of way for a spur track to certain factories which belonged to another company is not entitled to retain possession on the theory that the route was abandoned because the rightful owner constructed a track over another route which it was compelled to do because of its inability to obtain possession of its own right of way and the new route was temporarily adopted without any intention of abandoning the other route. *Atlanta, etc., Railroad Co. v. Southern Railway Co.*, 153 Fed. Rep. 122.

Filing of rates on inland transportation of goods to or from foreign countries.—The rates of transportation from places in the United States to ports of trans-shipment and from ports of entry to places in the United States of goods carried on through bills of lading are required to be filed and published under the amended interstate commerce act. This requires filing where the goods are carried under an aggregate through rate which is the sum of the ocean rate and the domestic rate, or if carried under a joint through rate by virtue of a common control management or arrangement of the inland and ocean carriers. *Armour Packing Co. v. United States*, 153 Fed. Rep. 1.

Obligation of purchasing railroad to assume contracts of predecessor.—The Circuit Court of Appeals of the Sixth Circuit holds that the Ohio statute allowing railroad companies to purchase non-competing lines and providing that the purchasing road shall be subject to all the "duties, obligations and restrictions" of the predecessor company does not require the purchasing company to fulfill a contract to carry a shipper's product at a rate agreed upon with the former company. This is not an "obligation" within the meaning of the statute, the purchaser never having agreed to assume the liability. *Rice v. Norfolk & Western Railway Co.*, 153 Fed. Rep. 497.

Speed of trains.—It is a general rule of general acceptance among the courts that in the absence of a regulating statute or ordinance a railroad company may run its trains at such a rate of speed as it deems convenient for the conduct of its business without being guilty of negligence *per se* in case a derailment occurs and injures one on its train by permission but not as a passenger. *Chicago & Northern Railway Co. v. O'Brien*, 153 Fed. Rep. 511.

Construction of indictments under Elkins law.—Judge Hazel announces as a rule for the construction of indictments under the Elkins law that any doubts as to the correct construction of the statute should be resolved in favor of the evident intention of Congress that equality among shippers should be maintained and unjust discrimination and favoritism of all kinds condemned, leaving the question whether the existing conditions justified the difference in rates charged to be determined as one fact on the trial. He also holds that the act is not restricted to departures from an established tariff rate, but is violated if any other advantage is given to a shipper whereby a discrimination is practiced. *United States v. Vacuum Oil Co.*, 153 Fed. Rep. 598.

Evasion of interstate commerce law by use of different routes.—The words "between any points" in Section 6 of the interstate commerce law making it unlawful for any common carrier or party to any joint tariff to charge a shipper a greater or less rate for transportation "between any points" as to which a joint rate is named thereon then is specified in the schedule filed with the commission in force at the time is not limited to points on the established route but forbids the transporting of property between different terminals in different states at a greater or less rate than the established rate though over different routes. *United States v. Pennsylvania Railroad Co.*, 153 Fed. Rep. 625.

Duty of local carrier to file rates.—The provision of the interstate commerce law requiring several common carriers operating a through line engaged in interstate commerce to file schedules of rates constituting the basis of a through interstate rate, intends that each carrier though operating a line wholly within a state must comply with the provision, if it is a portion of a through route engaged in interstate commerce through a common arrangement with other connecting carriers. *United States v. New York Central & Hudson River Railroad Co.*, 153 Fed. Rep. 630.

Solenoid Signals on the Manhattan Elevated.

The Interborough Rapid Transit Co. has recently put in service on the sharpest curves of the elevated lines 21 semaphore block signals, operated by solenoids energized by current taken from the third rail. The current for the track circuit is also obtained from the third rail. Eight of these signals have been installed at the reverse curves on the three-track Ninth avenue line at 110th street, four on the Third street curve of the Sixth avenue line, four on the Murray street curve of the same line and five near Coenties Slip on the Second avenue line, a total of 21. Twenty more will shortly be put in service at other curves on the Second and Third avenue lines. Nine signals of this type, but controlled with an alternating

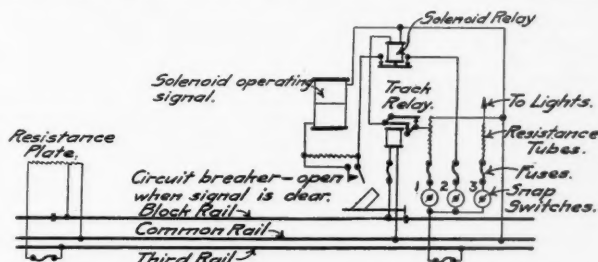


Fig. 1—Diagram of Connections for Solenoid Signal.

current track circuit, have been in use for more than 1½ years on the West Farms elevated extension of the subway. The signals at Murray street and Third street on the Sixth avenue line replace mechanical signals operated by track instruments which have been in use at these points for many years. Four of the signals at 110th street are for the middle express track, which is used by southbound express trains in the morning and by northbound expresses at night.

The apparatus and circuits for a typical block section are shown diagrammatically in Fig. 1. Only one of the track rails is insulated for the block section, which varies in length for the different curves on which the signals are used. At the outgoing end of the block the third rail is connected through a fuse to a resistance plate having two taps at the upper end, one of which is connected to the insulated track rail and the other to the opposite or common track rail, which is grounded for the return power circuit. The resistance is adjusted to give a difference of potential between the two track rails of 10 volts. At the entering end of the block the two track rails are connected together through a two-point track relay, which is wound to pick up at three volts. The normal difference of potential of 10 volts is sufficient to care for the widest variations in voltage of the third rail current passing through the resistance plate.

At the signal, a tap from the third rail connects to a bus bar on which are three snap switches, one in the solenoid relay circuit, one in the solenoid circuit, and one in the signal lamp circuit. When no train is in the block the track relay is energized and its two contacts are closed. Current from the third rail passes through switch 1, resistance, track relay armature, solenoid relay coil and thence to common rail or ground. Current also flows through switch 2, armature of solenoid relay and resistance of 3,000 ohms to solenoid coil and thence to ground, holding the signal in the proceed position.

When a train enters the block the track relay opens, releasing the spring-actuated quick-break solenoid relay, whose armature carries 600 volts. This breaks the solenoid circuit and permits the

signal arm to go to stop by gravity. An oil dash pot is provided to cushion the shock of the moving arm. When the train passes out of the block the track relay picks up causing the solenoid relay in turn to pick up. A current of 600 volts then flows through the solenoid relay armature and the circuit breaker which is closed. This gives a powerful circuit in the signal solenoid to move the signal down, but as soon as the arm reaches the proceed position the cir-

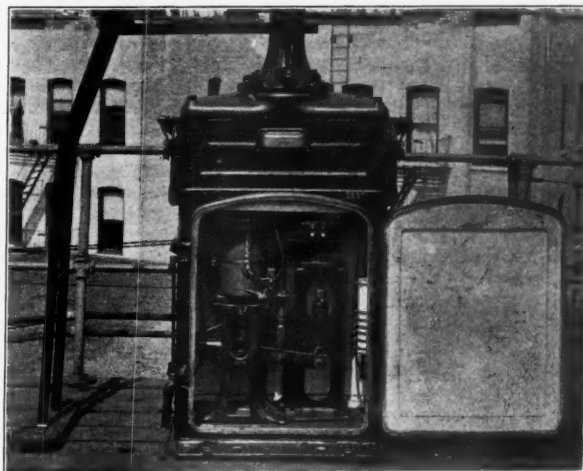


Fig. 2—View of Mechanism of Solenoid Signal.

cuit breaker opens, cutting in the high resistance and allowing only a small current, enough to hold the signal in the clear position, to flow through the solenoid.

Fig. 2 shows the signal mechanism enclosed in the iron case at the foot of the mast. The solenoid plunger is connected to a pivoted lever to which the dash pot is fastened at its outer end. The signal pull rod is fastened about midway between the solenoid plunger and the dash pot. Resistance tubes are mounted on one side of the case and the circuit breaker attached to the signal rod can be seen just above the dash pot. In the upper part of the case are the two relays and the snap switches. The entire mechanism is simple, strong and compact and cannot easily get out of order. Good results have been obtained from the special track relays em-



Fig. 3—High Semaphore Solenoid Signal for Manhattan Elevated.



Fig. 4—Centrally Pivoted Semaphore Signal for Express Track at 110th Street.

ployed, which are made with carbon points on the springs bearing on german silver pedestals. The quick-break solenoid relays, carrying 600 volts, have also proved entirely satisfactory. Pittsburg insulated joints of the latest pattern are used in the track and are said to be standing up well under the heavy traffic which passes over them. On the northbound local track at 110th street,

56 trains pass in one hour from 8:40 to 9:40 a.m., and in 24 hours 771 trains use the northbound local track at this point.

Fig. 4 shows the special signal arm used for the middle express track at 110th street. Owing to the narrow clearance of only 40 in. between trains on the middle track and outside tracks, a standard semaphore arm could not be used unless elevated above the tops of the cars. The centrally pivoted arm shown was therefore designed. It is 36 in. long and 6 in. wide, and when in the clear position the upper corner is about 6 in. below the window sill of a car. The arm is made of sheet metal in two pieces, hinged with a spring so as to prevent damage in case a projection on a car should strike either end. It is painted red with white bands on the front side and white with black bands on the back side. The signal mechanism is in a case supported on the elevated structure below the deck. Four signals of this type are in use.

All the signal apparatus was furnished by the Union Switch & Signal Co., Swissvale, Pa., but the signals were installed by the regular force of the Interborough Rapid Transit Co. under the direction of J. M. Waldron, Signal Engineer.

Wages and Retail Prices of Food in 1906.

The annual investigation of the Bureau of Labor into wages and the retail prices of food, the report on which has just been placed in the hands of the printer, shows that in the principal manufacturing and mechanical industries of the country average wages per hour in 1906 were 4.5 per cent. higher than in 1905, the regular hours of labor per week were 0.5 per cent. lower, and the number of employees in the establishments investigated was 7 per cent. greater. The average full-time weekly earnings per employee in 1906 were 3.9 per cent. greater than in 1905.

During 1906 wages were increased generally in nearly all industries, 40 of the 41 industries covered by the investigation showing some increase. The greatest increase was in the manufacture of cotton goods, where the average wages per hour in 1906 were 11.2 per cent. higher than in 1905. In the manufacture of electrical apparatus and supplies the increase was 10.1 per cent. In street and sewer work done by contract the increase was 8.7 per cent.; in iron and steel, Bessemer converting, 8.5 per cent., and in the manufacture of cigars, 8.4 per cent. In the manufacture of bar iron the increase in wages per hour was 6.9 per cent. and in the building trades, 6.1 per cent. Briefly stated, two industries showed an increase in hourly wages of more than 10 per cent., 7 industries an increase of 5 per cent., but less than 10 per cent., and 31 industries an increase of less than 5 per cent. In one industry—paper and wood pulp—there was a decrease of 1.1 per cent. In the industries as a whole, weighted according to importance, the increase in hourly wages was 4.5 per cent.

The fact should be borne in mind that these figures apply only to wageworkers in manufacturing and mechanical industries and do not show conditions, so far as salaried employees are concerned.

The retail prices of food, weighted according to consumption in representative workingmen's families, were 2.9 per cent. higher in 1906 than in 1905. As the advance in wages per hour from 1905 to 1906 was greater than the advance in the retail prices of food, the purchasing power of an hour's wages, as measured by food, was greater in 1906 than in the preceding year. In 1906 the purchasing power of an hour's wages as expended for food was 1.4 per cent. greater than in 1905, and the purchasing power of a full week's wages was 1 per cent. greater in 1906 than in 1905, or, in other words, an hour's wages in 1906 in the manufacturing and mechanical industries of the United States would purchase 1.4 per cent. more food than an hour's wages in 1905, and a full week's wages in 1906 would purchase 1 per cent. more food than a full week's wages in 1905.

The price of food was higher in every month of 1906 than in the corresponding month of 1905. The increase over the corresponding month of the preceding year, which in February, 1906, was only 0.4 per cent., grew steadily greater throughout the year, the price in December, 1906, being 5.1 per cent. above that of the preceding December. The price in December, 1906, was 4.8 per cent. higher than the average for the year 1906, which year showed a higher average than any other year during the seventeen years, 1890 to 1906, covered by the investigation of the Bureau of Labor.

The increase in prices in 1906 over 1905 applied, in unequal degree, to 25 of the 30 articles included in the investigation. The articles which showed the greatest advance in prices are lard, 9.8 per cent.; evaporated apples, 9.1 per cent.; fresh pork, 8.8 per cent.; dry or pickled pork, 8.7 per cent.; bacon, 8.4 per cent.; ham, 7.3 per cent., while the advance in fresh fish and mutton exceeded 5 per cent. The only articles which showed any material decrease are flour and sugar.

The articles which showed the most marked advance in prices in December, 1906, over December, 1905, are butter, 15 per cent.; lard, 13.9 per cent.; fresh pork, 12.2 per cent.; dry or pickled pork, 11.9 per cent.; bacon, 11.1 per cent., and ham, 9.8 per cent. The only articles which showed any marked decline in price in December,

1906, from the price in December, 1905, are potatoes, 5.8 per cent., and flour, 4.8 per cent.

As compared with the average for the ten-year period, 1890 to 1899, the average wages per hour in 1906 were 24.2 per cent. higher, the number of employees in the establishments investigated was 42.9 per cent. greater, and the average hours of labor per week were 4.6 per cent. lower. The average earnings per employee per full week in 1906 were 18.5 per cent. higher than the average earnings per full week during the ten years, 1890 to 1899.

The retail price of the principal articles of food, weighted according to family consumption of the various articles, was 15.7 per cent. higher in 1906 than the average price for the ten years, 1890 to 1899. Compared with the average for the same ten-year period, the purchasing power of an hour's wages in 1906, as measured by food, was 7.3 per cent. greater, and of a full week's wages, 2.4 per cent. greater, the increase in the purchasing power of the full week's wages being less than the increase in the purchasing power of hourly wages because of the reduction in the hours of labor.

The table following shows the per cent. of increase or decrease in wages per hour, hours of labor per week, the purchasing power of wages, etc., in 1906 in the manufacturing and mechanical industries, as compared with each year preceding, back to and including 1890, and as compared with the average for the ten years, 1890 to 1899:

Year.	Em- ploy- ees.	Hours per week.	Wages per hour.	Per Cent. of Increase (+) or Decrease (—), in 1906, as Compared with Previous Years.			
				Full-time earn- ings per em- ployee.	—Retail prices of food— Purchas- ing power		Full-time earn- ings per em- ployee.
					Weighted accord- ing to family consump- tion.	Hour- ly wages.	
Av'g 1890-1899..	+42.9	—4.6	+24.2	+18.5	+15.7	+7.3	+2.4
1890.....	+50.7	—5.3	+23.8	+17.3	+13.0	+9.6	+3.9
1891.....	+46.9	—5.1	+23.8	+17.6	+11.5	+11.1	+5.5
1892.....	+44.1	—5.1	+23.2	+17.0	+13.5	+8.5	+3.9
1893.....	+43.8	—4.9	+23.1	+17.1	+10.8	+11.1	+5.7
1894.....	+51.9	—4.4	+26.9	+21.3	+16.0	+9.3	+4.5
1895.....	+48.2	—4.7	+26.3	+20.4	+18.3	+6.8	+1.8
1896.....	+44.9	—4.4	+24.6	+19.1	+21.2	+2.8	—1.7
1897.....	+41.6	—4.2	+24.7	+19.5	+20.1	+3.8	—0.6
1898.....	+34.3	—4.3	+24.0	+18.6	+17.2	+5.7	+1.2
1899.....	+27.5	—3.8	+21.8	+17.1	+16.3	+4.7	+0.7
1900.....	+23.6	—3.3	+17.7	+13.8	+14.4	+2.8	—0.6
1901.....	+20.0	—2.8	+15.0	+11.9	+10.0	+4.5	+1.7
1902.....	+15.6	—2.0	+10.7	+8.5	+4.3	+6.0	+4.0
1903.....	+13.0	—1.2	+6.8	+5.5	+4.9	+1.8	+0.6
1904.....	+13.7	—0.5	+6.2	+5.6	+3.6	+2.5	+2.0
1905.....	+7.0	—0.5	+4.5	+3.9	+2.9	+1.4	+1.0

Twenty-five Passengers Killed at West Canaan, N. H.

In a butting collision on the Boston & Maine, near Canaan, N. H., about 4:26 o'clock on the morning of September 15, 25 passengers were killed and as many more were injured. Canaan is between White River Junction and Concord, and is 18 miles east of White River Junction. The collision occurred in a dense fog where the enginemen approaching each other could see nothing until they were very near together. Both were running fast, the freight on a down grade of about 50 ft. to the mile. The passenger train was No. 30, southbound; and the northbound train (freight) was No. 267. An order had been delivered to the freight intended to give it the right of the road over passenger train No. 34, but, by a mistake in transmitting or copying, the order as delivered read "No. 30," and this caused the collision. Most of the victims were in a passenger car of comparatively light construction which was immediately behind a heavy baggage car and was completely telescoped by it.

An officer of the road issued a statement of the cause which says: "Train 267 arrived at Canaan at 4:10, on time. Train 30, consisting of engine, baggage car, coach, smoker and one sleeping car, left White River Junction at 3:55 a.m., 45 minutes late. Train 34 left White River Junction at 5 a.m., one hour and 36 minutes late. At East Andover, 27 miles south of Canaan, an order was sent 267 (and the same order to trains 30 and 34 at White River Junction), giving the former (267) 40 minutes on the time of train 30 and 30 minutes on the time of train 34, these orders being repeated back and completed in the usual manner.

"At Canaan orders were sent 267 annulling the former order and giving it one hour and ten minutes on the time of 34. The same order was given to No. 34 at White River Junction; both were repeated back to the dispatcher, and, according to the records, exactly as sent, although, for some as yet unexplained reason, the order which was delivered to the engineer and conductor of No. 267 at Canaan gave them one hour and ten minutes over train 30, which had not then arrived at Canaan. This order should have read 'No. 34,' and, according to the dispatcher's records, it was so sent and repeated by the Canaan operator. This discrepancy can be cleared only by a thorough investigation, which will be made at once."

This seems to indicate that the conductor of the freight, having been informed (erroneously) that No. 30 was 70 minutes late, and having calculated that this would permit him to go to the next station, went on in disregard of the right of passenger train No.

34; for No. 34, according to the *Official Guide* is due at Canaan at 4.20, only 10 minutes after the time (4.10) given in the statements as the time that the freight arrived there; but another statement says that the freight conductor held an order received at West Hanover that No. 34 was 40 minutes late.

The error lies between J. A. Crowley, night despatcher at Concord, who has been in the service seven years, and John Greeley, night operator at Canaan, who has seen 23 years' service.

The Uniform Bill of Lading.

The proposal to have the new uniform bill of lading which was agreed to at Chicago adopted formally by the Interstate Commerce Commission is not going to have plain sailing, after all. In the order issued by the Commission on the eighth of July, calling upon all railroads to appear in Washington, October 15, to present their objections, if they had any, it was stated that the petitioners and all the railroads in Official Classification territory had approved the form; but objections are now likely to be presented by the Freight Claim Association and by a conference of bankers and freight receivers, which was recently held in New York city. The Freight Claim Association embraces in its membership, of course, many claim agents of roads not in Official Classification territory. The president of the Association, Mr. R. C. Richards, has issued a circular calling the attention of the members to that clause in the proposed bill, which makes the carrier liable for fire loss for 48 hours after freight has arrived at destination, and he suggests that, in view of the hearing to be held at Washington, October 15, each road should carefully consider whether it approves this clause.

Quoting the fire-loss clause (printed in italics below), Mr. Richards says:

"This would, if adopted, presumably make the carrier liable as an insurer for such damage until 48 hours had elapsed after notice had been given of the arrival of the property and in case of loss or damage occurring after that time 'The burden to prove freedom from such negligence shall be on the carrier or party in possession.'

"In the following states of the Union the liability of the carrier now ceases as soon as the property (if in less than carload lots) is unloaded into the freight house and ready for delivery; if in carload lots—when the car has been placed on delivery track; no notice being required:

"Georgia, Illinois, Indiana, Iowa, Massachusetts, Missouri, North Carolina, Pennsylvania, South Carolina, Tennessee.

"No argument is necessary to demonstrate that this rule, which has been announced by the highest courts of the states above mentioned, is much more favorable to the carrier than the one intended to be prescribed in the proposed uniform bill of lading.

"In the states named below, the liability of the carrier as an insurer now ceases as soon as the property has been unloaded and is ready for delivery (if in less than carload lots), or placed for unloading if in carloads and consignee has had a reasonable time (which may be less than 48 hours) to unload. No notice being required:

"Arkansas, Kansas, Kentucky, Louisiana, New Hampshire, Vermont, West Virginia, Wisconsin.

"This rule, which the Supreme Courts of the states last mentioned have held to be the law, is also distinctly more favorable to the carrier than the one proposed in the bill of lading under discussion.

"In the following states the liability of the carrier now ceases after the property has been unloaded and is ready for delivery (if in less than carload lots), and if in carload lots after car has been placed for delivery and notice has been given or sent to the owner of the arrival and a reasonable time to take possession (which may be less than 48 hours, depending upon the circumstances of the case):

"Alabama, California, Minnesota, Mississippi, Oklahoma, Ohio, Michigan, New York, Texas.

"The rule adopted in these states is unquestionably as favorable as the one proposed for adoption in the bill and I believe will, upon careful consideration, be found to be more to the interest of the carriers. In the other states the question seems not to have been determined.

"I understand that in none of the states is the burden of proof now on the carrier to show itself free from negligence where claim is made for loss or damage to property held by it as a warehouseman; on the contrary, the burden is now on the owner to show that the property was damaged by the negligence of the carrier. If the clause referred to in the proposed bill of lading is agreed to by the carrier and printed in the bill, the burden of proof would be changed and the carrier would in all probability, in view of the well known tendencies of juries, be made liable as an insurer until the property was actually delivered to the consignee, even though the loss or damage was brought about by violence of mobs or strikers and without any negligence on the part of the carrier who was compelled to hold the goods in its freight house because the consignee

neglected or refused, for his own convenience, to remove the same.

"There would seem to be no good reason why the railroads of the country should voluntarily assume such additional liability, the burden of which the law has never imposed upon them and which, if assumed, might in a single instance (such as the destruction of large terminals by fire originating without the carrier's negligence, but caused by mobs) amount to hundreds of thousands of dollars.

"I am advised that there is no provision in the law empowering the Interstate Commerce Commission to change the law of the land or the rules of evidence or to require interstate carriers to use a bill of lading containing such provisions. * * *

So much for Mr. Richards' objection. The New York complain-ers are from two classes; first, heavy receivers of cotton, hay, grain and fruit and provisions, and, second, members of the New York State and the American Bankers' Associations. These merchants are constantly paying for thousands of dollars' worth of merchandise on drafts supported by bills of lading, and both merchants and bankers desire to have all bills of lading more thoroughly protected against fraud. Their main trouble is with forged and altered bills of lading. This danger, so far as it can be dealt with by the railroads, is an obscure one, for it can be completely met only by employing a most experienced, intelligent and upright business man at every little shipping station in the country. Courts have in many cases held that a bill of lading given for freight not actually delivered did not bind the railroad. The bankers want to have all bills serially numbered or otherwise safeguarded so that the banks can treat them as incontestable. In England, they say, this difficulty has been provided for by statute.

The conditions of the proposed uniform bill, as printed by the Interstate Commerce Commission, are given below. The foot notes indicate additions which will be proposed by the American Bankers' Association.

UNIFORM BILL OF LADING—ORIGINAL.

_____, Railroad Company.

Received subject to classification and tariffs in effect on the date of issue of this Original Bill of Lading at _____, 1907, from _____

_____, the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned and destined as indicated below, which said company agrees to carry to its usual place of delivery at said destination, if on its road; otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of the said route to destination and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the conditions, whether printed or written, herein contained (see conditions on back hereof) and which are agreed to by the shipper and accepted for himself and his assigns as just and reasonable. In issuing this bill of lading this company with respect to the portion of the route beyond its own line acts only as agent and agrees to transport only over its own line.

Nothing herein contained, however, shall be construed as exempting the initial carrier from the liability, if any, imposed upon it by law for loss, damage, or injury not occurring on its own line or its portion of the through route or occurring after said property has been delivered to the next carrier.

*If the word "order" is written in connection with the name of the party to whose order the property is consigned, the surrender of the original bill of lading, properly endorsed, shall be required before delivery of the property.¹ Inspection will not be permitted on order bills of lading unless permission is endorsed on the original bill of lading or given in writing by² the shipper.

If the word "order" does not so appear, the bill of lading is "not negotiable," and said property may be delivered without requiring such surrender.

NOTE.—The foregoing will appear on the front, or first, page of the bill of lading.

The bill of lading is to be signed by the shipper and [by the] agent of the carrier issuing same, and space should be provided for such signatures.

The detail arrangement respecting such other matters as customarily appear on the face of the bill of lading will be later prescribed.

CONDITIONS.

SECTION 1. The carrier or party in possession of any of the property herein described shall be liable for any loss thereof, or damage thereto, except as hereinafter provided.

No carrier or party in possession of any of the property herein described shall be liable for any loss thereof or damage thereto or delay caused by the act of God, the public enemy, quarantine, the authority of law, or the act or default of the shipper or owner, or for differences in the weights of grain, seed, or other commodities caused by natural shrinkage, or discrepancies in elevator weights. For loss, damage, or delay caused by fire occurring after 48 hours (exclusive of legal holidays) after notice of the arrival of the property at destination or at port of export (if intended for export) has been duly sent or given, the carrier's liability shall be that of warehouseman only. Except in case of negligence of the carrier or party in possession (and the burden to prove freedom from such negligence shall be on the carrier or party in possession) the carrier or party in possession shall not be liable for loss, damage, or delay occurring while the property is stopped and held in transit upon request of the shipper, owner or party entitled to make such request³;

¹The committee of the American Bankers' Association proposes a slight change in this paragraph and also proposes six new clauses to be inserted as indicated by the six following footnotes:

²When the bill has been surrendered it shall be immediately canceled. This provision shall apply even though the bill is marked not negotiable.

³By the holder thereof whether for value or for collection.

⁴Who, in the case of an order bill, shall be the holder thereof.

or resulting from a defect in the property or from riots or strikes. When in accordance with general custom, on account of the nature of the property, or when at the request of the shipper the property is transported in open cars, the carrier or party in possession (except in case of loss or damage by fire, in which case the liability shall be the same as though the property had been carried in closed cars) shall be liable only for negligence, and the burden to prove freedom from such negligence shall be on the carrier or party in possession.

SEC. 2. No carrier shall be liable for loss, damage, or injury not occurring on its own road or its portion of the through route, nor after said property has been delivered to the next carrier, except as such liability may be imposed by law, and any carrier shall be entitled to recover from the common carrier, railroad or transportation company on whose line the loss, damage or injury shall have been sustained the amount of such loss, damage, or injury as it may be required to pay to the owner of such property or to the holder of this bill of lading, provided that it has given notice to such carrier, railroad or transportation company at least 15 days before the payment of such claim, but no obligation respecting such recovery is hereby assumed by or imposed upon the shipper, owner, or consignee.

SEC. 3. No carrier is bound to transport said property by any particular train or vessel, or in time for any particular market or otherwise than with reasonable despatch, unless by specific agreement endorsed hereon. Every carrier shall have the right in case of physical necessity to forward said property by any railroad or route between the point of shipment and the point of destination; but if such diversion shall be from a rail to a water route the liability of the carrier shall be the same as though the entire carriage were by rail.

The amount of loss or damage for which any carrier is liable shall be computed on the basis of the value of the property (being the bona fide invoice price, if any, to the consignee, including the freight charges, if prepaid) at the place and time of shipment under this bill of lading, unless a lower value has been agreed upon or is determined by the classification or tariff upon which the rate is based, in either of which events such lower value shall be the maximum amount to govern such computation, whether or not such loss or damage occurs from negligence.

Claims for loss, damage, or delay must be made in writing to the carrier at the point of delivery or at the point of origin within 60 days after delivery of the property, or, in case of failure to make delivery, then within 60 days after a reasonable time for delivery has elapsed. Unless claims are so made the carrier shall not be liable.

Any carrier or party liable on account of loss of or damage to any of said property shall have the full benefit of any insurance that may have been effected upon or on account of said property.⁴

SEC. 4. All property shall be subject to necessary cooperation and baling at owner's risk. Each carrier over whose route cotton is to be transported hereunder shall have the privilege, at its own cost, of compressing the same for greater convenience in handling or forwarding, and shall not be held responsible for deviation or unavoidable delays in procuring such compression. Grain in bulk consigned to a point where there is a railroad, public or licensed elevator may (unless otherwise expressly noted herein, and then if it is not promptly unloaded) be there delivered and placed with other grain of same kind and grade without respect to ownership, and if so delivered shall be subject to a lien for elevator charges in addition to all other charges hereunder.

SEC. 5. Property not removed by the party entitled to receive it within 48 hours (exclusive of legal holidays) after notice of its arrival has been duly sent or given, may be kept in car, depot, or place of delivery of the carrier, or warehouse, subject to a reasonable charge for storage and to carrier's responsibility as warehouseman only; or may be, at the option of the carrier, removed to and stored in a public or licensed warehouse at the cost of the owner and there held at the owner's risk and without liability on the part of the carrier, and subject to a lien for all freight and other lawful charges, including a reasonable charge for storage.

The carrier may make a reasonable charge for the detention of any vessel or car or for the use of tracks after the car has been held 48 hours (exclusive of legal holidays) for loading or unloading, and may add such charge to all other charges hereunder, and hold such property subject to a lien therefor. Nothing in this section shall be construed as setting aside any local law or rule affecting car service or storage.

Property destined to or taken from a station at which there is no regularly appointed agent shall be entirely at risk of owner when unloaded from cars or until loaded into cars, and when received from or delivered on private or other sidings shall be at owner's risk until the cars are attached to and after they are detached from trains.⁵

SEC. 6. No carrier will carry or be liable in any way for any documents [or] specie, or for any articles of extraordinary value not specifically rated in the published classification or tariff, unless a special agreement to do so and a stipulated value of the articles are endorsed hereon.

SEC. 7. Every party, whether principal or agent, shipping explosive or dangerous goods, without previous full written disclosure to the carrier of their nature, shall be liable for all loss or damage caused thereby, and such goods may be warehoused at owner's risk and expense or destroyed without compensation.

SEC. 8. The shipper, owner, or consignee shall pay the freight and all other lawful charges accruing on said property before delivery. If upon inspection it is ascertained that the articles shipped are not those described in this bill of lading the freight charges must be paid upon the articles actually shipped.

SEC. 9. Except in case of diversion from rail to water route, which is provided for in Section 3 hereof, if all or any part of said property is carried by water over any part of said route, such water carriage shall be performed subject to the liabilities, limitations, and exemptions provided by statute, and to the conditions contained in this bill of lading not inconsistent with such

statutes or this section, and subject also to the condition that no carrier or party in possession shall be liable for any loss or damage resulting from the perils of the lakes, sea, or other waters, or from explosion, bursting of boilers, breakage of shafts, or any latent defect in hull, machinery, or appurtenances; or from collision, stranding, or other accidents of navigation, or from protraction of the voyage. And any vessel carrying any or all of the property herein described shall have the liberty to call at intermediate ports, to tow and be towed, and assist vessels in distress and to deviate for the purpose of saving life or property.

The term "water carriage" in this section shall not be construed as including lighterage across rivers or in lake or other harbors, and the liability for such lighterage shall be governed by the other sections of this instrument.

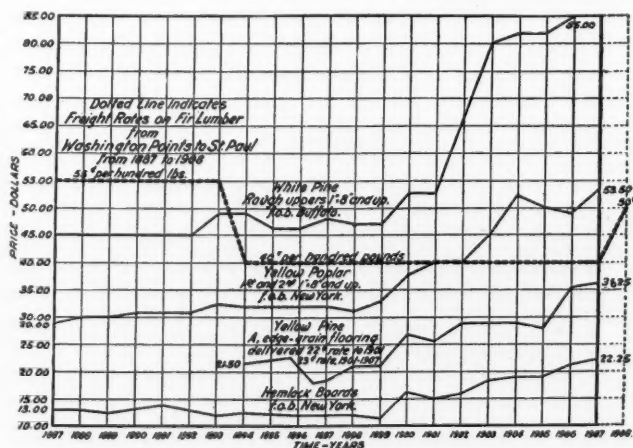
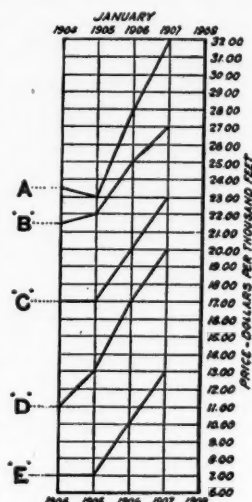
When property is carried under a rate which includes marine insurance the liability of the water carrier shall cover all risks insured against and shall at least equal the liability hereunder for rail carriage in closed cars.

SEC. 10. Any alteration, addition or erasure⁶ in this bill of lading which shall be made without an endorsement thereof hereon, signed by the agent of the carrier issuing this bill of lading, shall be without effect, and this bill of lading shall be enforceable according to its original tenor.

Increased Cost of Lumber.

The following diagrams from the report on increased lumber prices, issued by the United States Department of Agriculture, show how great the increases have been in the last 20 years, and especially in the last five years. Lumber prices, prior to 1893, show little change, and the tonnage handled by the railroads was of relatively slight importance; but in 1893 the railroads, having an excess of eastbound empty cars on account of the steady increase in west-bound merchandise shipments and construction material, created by the growth of the Pacific Coast country, lowered the freight rate to a 40 per cent. basis in an effort to encourage the lumber industry and to get a back haul.

From 1893 until 1900, although the tonnage increased, the lumbermen secured only a moderate advance in prices, but in recent years conditions have changed materially. The prices of lumber have almost doubled and the principal difficulty the lumberman has had has been to get his product hauled to eastern markets. The demand for cars has exceeded the supply and the railroads have been compelled to send empty cars across the continent for this purpose. In the face of these conditions, it is claimed by the railroads that the continuance of a rate which does not bear its proper share of the transportation cost is indefensible and



Prices of Washington Fir Lumber.

- A. Fir siding and roofing, 1 in. x 4 in., or 6 in.
- B. Fir flooring, 1 in. x 4 in., or 6 in., 10 ft. to 16 ft.
- C. Fir drop siding, 1 in. x 6 in., 10 ft. to 16 ft.
- D. Fir car sills, rough, 35 ft. to 40 ft.
- E. Fir railroad ties, 7 in. x 9 in. x 8 ft.

indicates that other traffic is being saddled with a burden not co-ordinate with the factors which should determine proper rates. The diagrams, as shown, tend to indicate that the old rates inaugurated to fit the conditions of 1894 are not co-ordinate with the conditions which exist to-day. A 10 per cent. increase from the Pacific Coast to St. Paul and Minneapolis has been proposed and is apparently justified by existing conditions.

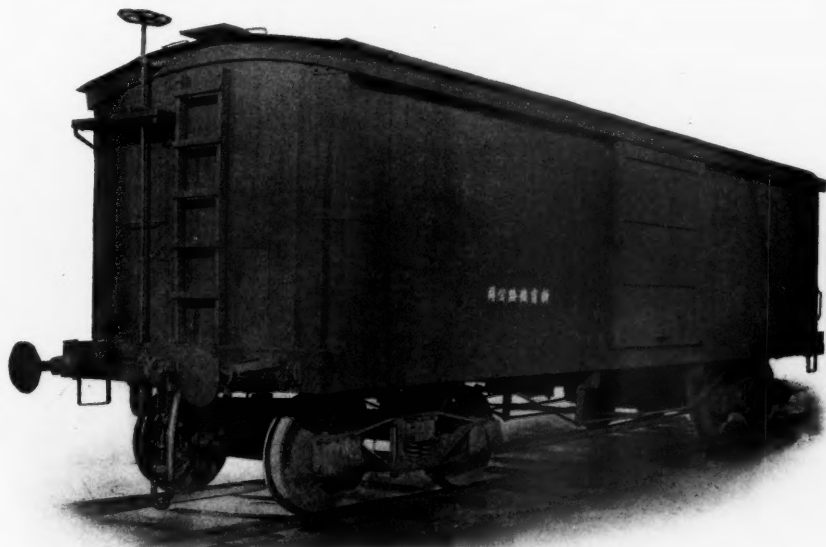
⁶ Fraudulent or otherwise.

⁴ So far as it is consistent with the terms of the contract or policies of insurance.

⁵ But this provision shall not apply to property on which order bills have been issued unless such bills are marked "shippers load and count." (S. L. & C.)

American Cars for Chinese Railroads.

The Middletown Car Works, Middletown, Pa., has recently built and shipped to the Sun Ning Railroad in China a number of 20-ton box and flat cars which are a combination of United States and German standard construction. The Sun Ning Railroad is a short road being built in Central China by native capital and in some of the details of its equipment it reflects the influence of the German engineers in charge of the Shantung Railroad. The gage of the road is 4 ft. 8½ in. and in most other respects the standards employed in the United States have been followed but the coupling attachments of these cars are of German design and were imported



20-Ton Box Car; Sun Ning Railroad.

from Germany by the builders. The center line of draft is 3 ft. 5½ in. above the rails and a form of screw coupling is employed with the usual side buffers. The car bodies and trucks are built to M. C. B. standards throughout.

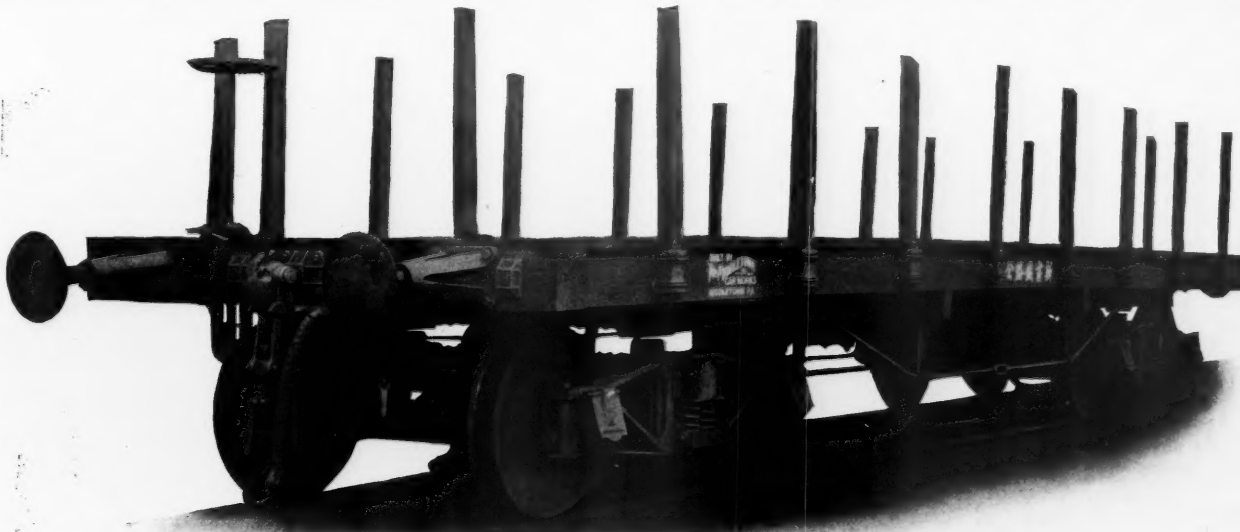
The box cars have wooden underframes and bodies with corrugated iron roofs. They are 29 ft. 6¾ in. long, 8 ft. ¾ in. wide and 6 ft. 4 in. high, inside measurements, and 32 ft. long over end

Vanadium Steel.

For several years the question of the day for modern metallurgy has been that of investigating the several alloys of steel that have a tendency to modify the texture of the metal so that it may be better and better adapted to the diversified requirements of modern industries. The addition of a foreign metal may result in increasing the resistance to shock, or raising the limit of elasticity, or in increasing the ductility of the steels so that these various modifications necessitate a very careful study of the alloy. The last to be used, and one which, for many years, has attracted a great deal of attention among metallurgists, is vanadium.

Before pointing out the characteristic properties of vanadium steel our readers will permit of a short digression regarding vanadium itself. At the beginning of the last century vanadium was discovered and christened "Erithrone" by a professor of mineralogy in Mexico, Del Rio, who first gave the new metal the name of "panchrome." An analysis of a specimen of this mineral sent to France by Humboldt, led Collet Descotils to admit the presence of chromium, but not that there was a new metal, and Del Rio himself retracted his first opinion and attributed the brown appearance of Zimapan to a basic chromate of lead. Thus, scarcely had it become known before it was disowned by its discoverer and was relegated to Zimapan without arousing any controversy whatever. Thirty years after, in November, 1830, Berzelius wrote to Dulong that: "M. Sofstrom, Director of Mines at Fahlun, in examining a sample of iron that was remarkable for its extreme softness, had detected the presence of a substance * * *." This new substance, which was somewhat more abundant in the pig than in the puddled iron, and consequently more abundant in the slag, was called "vanadium," a word taken from Vanadia, a surname of Freya, one of the principal goddesses of Scandinavian mythology. Vanadium was thus rediscovered, but the investigation of its properties has only been consummated recently.

In 1841 vanadium was found in a large number of iron and copper mines, and French science claims the honor of having recognized it as one of the most widely diffused of the metals of the crust of the earth. The masses of bauxites of the south of France contain it in notable quantities, from which it is obtained for use in ceramics just as the clays are. But the actual amount contained is very small, being from 0.09 to 0.06 per cent. at Rovest and in



20-Ton Flat Car; Sun Ning Railroad. Built by the Middletown Car Works.

sills. The trucks are of the diamond arch bar type with double I-beam bolsters and channel swing plank. Cast-iron wheels 33 in. in diameter, M. C. B. axles with 3¼-in. x 7-in. journals and M. C. B. boxes are used. The cars are fitted with Westinghouse air-brakes with 8-in. cylinders. The flat cars are 32 ft. long and 8 ft. 9 in. over the floor, and are identical in other respects with the box cars.

Calabria. The researches of Dienlafait, of MM. Osmond and Witz show that the basic slag of the oolithic mineral of Mazenay contains more than 1 per cent. of vanadium. In short, it appears that the rocks in which vanadium occurs are those formed by the deposits of ancient seas that have dried.

The content of vanadium rarely reaches 0.4 per cent. in those

minerals in which it is encountered. The principal minerals are vanadinite, which is a chlorovanadate of lead; chilecite, a double vanadate of lead and copper; dechinite, acroxene and enoynchite, which contains a large proportion of zinc. The presence of arsenic produces cuprodechlorite. These minerals are very numerous and, not to weary the reader, it may simply be added that one of the minerals that is richest in vanadium is the vanadiferous mica, roscoelite. To recapitulate, the principal minerals from which vanadium is obtained are: Vanadinite, which is found in Spain and which contains about 40 per cent. of lead, from 12 to 13 per cent. of vanadic oxide and silicon, some iron and silver; the vanadiferous ores of Colorado and the vanadiferous deposits of South America.

The metal vanadium is obtained by concentrating the oxide which is reduced in the presence of the oxide of iron in an electric furnace as in the production of aluminum. The two processes produce a ferro-vanadium, which frequently contains 80 per cent. of vanadium.

Vanadium was first used in the preparation of a black ink that was compounded by Berzelius, and then in coloring where it replaced the old process using the sulphate of copper. Extracted from the Creusot slag, it cost about \$27 a pound and sold for \$90. It was also used in ceramics and even in therapeutics.

The use of vanadium in metallurgy dates from 1896, when M. Choubley, Manager of the Firminy works, made a number of tests on ordinary steel tempered at 1,650 deg. Fahr. and annealed at about 480 deg. Fahr. to which a powder composed of the oxide of vanadium and aluminum was added. Although these tests were fruitless at first, the following results were finally obtained:

	Ordinary steel.	Vanadium steel.
Limit of elasticity	48,760 lbs.	70,625 lbs.
Ultimate strength	56,500 "	74,304 "
Elongation	10 per cent.	11.3 per cent.
Contraction of area	54 "	47 "

This shows an increase of 44.8 and 31.5 per cent. for the limit of elasticity and ultimate strength respectively. M. Chowbley decided to use a ferro-vanadium to add to the steel bath. This steel hardened in a remarkable manner under the influence of a rise of temperature.

More methodical investigations were undertaken by Mr. Arnold, a Professor in the Mechanical Institute of Sheffield in 1900. Vanadium was introduced as ferro-vanadium containing a small quantity of aluminum with the following results:

Chemical analyses.					Remarks.	Physical properties			
Combined carbon.	Estimated aluminum.	Aluminum per cent.	Estimated vanadium.	Vanadium, per cent.		Limit of elas- ticity in lbs. per sq. in.	Ult. strength in lbs. per sq. in.	Elongation, per cent.	Reduction of area, per cent.
Steel.									
1.00	0.04	0.07	0.12	0.14	11 mins. before pouring.	43,600	68,760	6.5	6.9
1.02	0.53	0.09	0.50	0.29	With the charge.....	43,760	77,140	8.5	10.0
1.00	0.53	0.36	0.50	0.58	21 mins. before pouring.	65,660	86,625	7.0	7.6
0.80	0.33	0.45	1.00	1.11	10 min. before pouring.	52,760	78,045	10.0	17.6
1.04	0.92	0.21	1.00	0.77	With the charge.....	59,530	85,075	7.5	9.3
Iron.									
0.05	0.12	0.05	1.00	0.85	10 mins. before pouring.	20,460	26,445	37.0	12.0

These results are very interesting and show what they are for themselves; an almost pure steel containing 1.10 per cent. of carbon had a limit of elasticity of about 30,500 lbs. per sq. in. of section and an ultimate breaking strength of 60,900 lbs. By referring to the table it will be seen that an addition of 0.14 per cent. of vanadium without making any appreciable change in the ductility of this steel raised its limit of elasticity by about 13,200 lbs. and its ultimate strength by about 79,000 lbs. Again the addition of 0.30 per cent. of vanadium raised the ultimate strength to 77,150 lbs. per sq. in., and 0.60 per cent. to 92,425 lbs. According to Mr. Arnold there is nothing to be gained by adding more than 0.60 per cent. of vanadium, for steel containing 0.77 per cent. gives almost identically the same results as that with 0.58 per cent.

The tempering makes it possible to obtain remarkable mechanical results with tools of vanadium steel, for the $\frac{1}{2}$ in. in diameter of the following composition:

Vanadium	0.268 per cent.
Nickel	2.54 "
Carbon	0.156 "
Manganese	0.42 "
Phosphorus	0.022 "
Sulphur	0.028 "

The physical properties of the annealed metal were:

Ultimate strength	38,575 lbs. per sq. in.
Limit of elasticity	31,475 lbs. per sq. in.
Elongation	34 per cent.
Contraction of area	57.5 "

After having been treated to about 3,650 deg. Fahr., which brought it up to a cherry red, it was plunged into cold water and then, without being reheated, it gave the following results:

Ultimate strength	95,500 lbs.
Or an increase of more than 147 per cent.	
Limit of elasticity	88,475 lbs.
Or an increase of more than 181 per cent.	
Elongation	10.0 per cent.
Reduction of area	18.3 per cent.

These figures show a great increase in ultimate strength and limit of elasticity.

An examination under the microscope shows that vanadium

tends to delay the separation of the carburets, which facilitates the operation of tempering, which can be done by merely raising it to a temperature of 1,600 deg. Fahr., and then immersing it in water without allowing for any reheating. Vanadium so hardens the molecular elements of the steel, such as the ferrite, that it is possible to bend a square bar cold without developing any fracture. Finally, one of the characteristics of vanadium steel is the very small proportion of contained carbon, which is usually from 0.10 to 0.15 per cent.

Vanadium steels may be divided into three classes: (1) Steels containing vanadium only; (2) steels containing vanadium and nickel; (3) steels containing vanadium and chromium.

The first usually contains from 0.10 to 0.15 per cent. of carbon and from 0.15 to 0.25 per cent. of vanadium. Vanadium has almost as much of an effect as the carbon upon the steel, and the fact that the tensile strength of almost pure iron, that is iron obtained electrolytically, is increased, for example, from 24,000 lbs. to 27,000 lbs. per sq. in. of section by the addition of a few tenths of vanadium, is certainly very remarkable and the obtaining of so great an effect with so small a cause can be classed among the marvels of modern science. The following are some interesting results that have been obtained by the addition of vanadium:

	In lbs. per sq. in.—	
	Ultimate strength.	Limit of elasticity
Soft steel, low in phosphorus	27,200	25,400
Carbonized by casting in a graphite crucible	28,100	25,000
With 0.50 per cent. of vanadium added	42,570	33,550
With 1 per cent. of vanadium added		
annealed	62,460	49,750
Same as above, annealed	45,235	37,050

This 1 per cent. vanadium steel is ordinarily used for pieces subjected to vibration, for it resists tensile stresses admirably and is elastic.

The second class of vanadium steels are those containing vanadium and nickel. Usually the proportions are from 0.20 to 0.40 per cent. of vanadium and from 2 to 6 per cent. of nickel. With these steels the tensile strength obtained ranges from 35,000 to 39,000 lbs. per sq. in. with a limit of elasticity of from 22,500 to 31,500 lbs., and an elongation varying from 30 to 35 per cent. After tempering the tensile strength and the limit of elasticity rises to 99,000 lbs. and 88,000 lbs. respectively, while the elongation is reduced to from 8 to 10 per cent. The nickel has a peculiar action in this respect that, up to a content of 8 per cent., it makes the steel hard, and that from 8 to 15 per cent. it makes it brittle so that it can be broken with a hammer; and that from 15 to 25 per cent. its ductility increases rapidly beyond which it remains stationary. Vanadium makes nickel steel more homogeneous and diminishes the tendency to brittleness which the nickel causes, though it is true that it is rarely used where the nickel content is more than 8 per cent. Owing to the fact that the nickel gives the metal a high capacity to resist shock, these steels are especially adapted for use in piston rods, cranks, coupling rods, small shafts and the like.

The third class of vanadium steels comprise those containing vanadium and chromium, and the best proportions are those included within the following limits:

Carbon	0.20 per cent.	0.40 per cent.
Chromium	1.00 "	1.00 "
Vanadium	0.20 "	0.20 "

Chromium increases the resistance to shock and the tensile strength, but it has a tendency to produce a very hard metal and one that is difficult to work hot, while welding can only be successfully done electrically, because of the tendency of chromium to oxidize and change into slag. The addition of chromium makes the metal difficult to cut and to work cold, and the Carnegie Steel Co. has found no better method of cutting sheets and plates made of chrome steel than to use a smooth disc revolving at high speed. This disc is 6 ft. in diameter and is mounted in the same way as a circular saw and can cut plates up to 6 in. in thickness. A jet of steam is made to impinge continuously against the metal on the line of the cut. The addition of from 0.15 to 0.25 per cent. of vanadium will counterbalance the tendency of the chromium and facilitate the cutting of steel sheets.

These steels are especially adapted for making crank shafts, propeller shafts, locomotive and car axles, vertical shafts, etc.

The following results show very clearly the influence of vanadium upon chrome steel:

		Lbs. per sq. in.—		Per cent.—	
		Ultimate strength.	Limit of elasticity.	Elongation.	Reduction of area.
Steel, carbon-manganese		25,150	14,835	35	60
" plus 0.50 per cent. chromium		32,250	20,640	33	61
" " 1.00 " chromium		36,120	23,220	30	57
" " 0.10 " vanadium		32,250	27,090	31	60
" " 0.15 " vanadium		34,185	29,025	26	59
" " 0.25 " vanadium		36,665	32,250	24	59
" " 1.00 " chromium					
" and 0.15 " vanadium		44,795	34,185	24	57
" plus 1.00 " chromium					
" and 0.25 " vanadium		58,050	46,085	19	46
" plus 1.00 " chromium					
" and 0.15 " vanadium		78,625	67,080	16	48
" plus 1.00 " chromium					
" and 0.25 " vanadium		90,235	75,140	12	45
" tempered					

The conclusion reached from all of these investigations which have been carried on in recent years, is that vanadium can be used to replace nickel, tungsten and molybdenum in the steel alloys.—*Revue Industrielle.*

Electric Locomotives of the Pennsylvania Railroad.

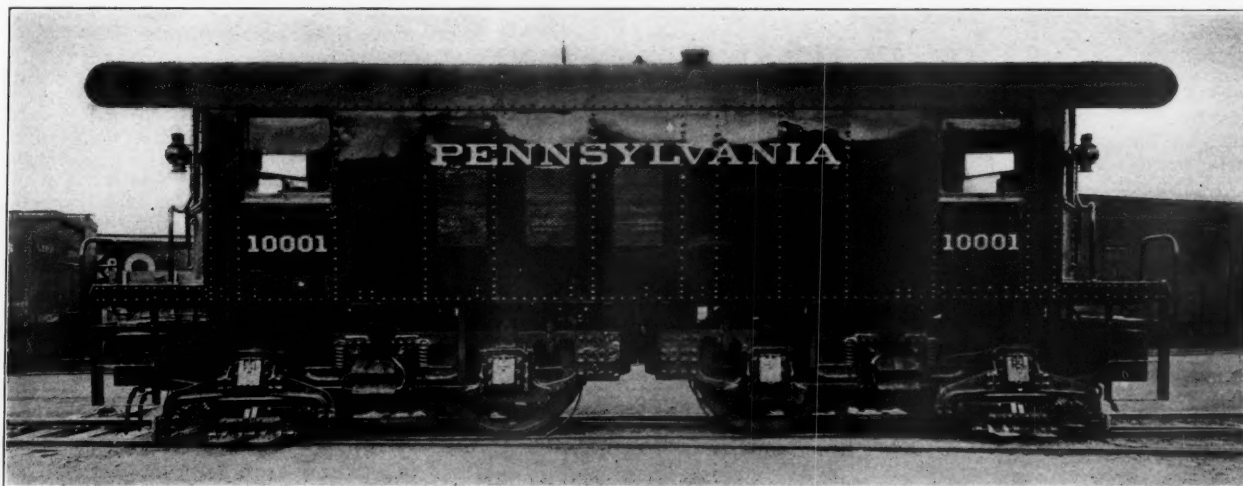
With a view to determining the type best adapted to pulling its heavy passenger trains through the New York tunnels, the Pennsylvania Railroad has in progress a series of experiments upon electric locomotives. Through the experiments, which are being conducted on its West Jersey & Seashore division and the Long Island Railroad, the company intends to determine some of the general characteristics of the electric locomotive and to secure operating data based on actual service.

Of the two direct-current locomotives now undergoing tests,

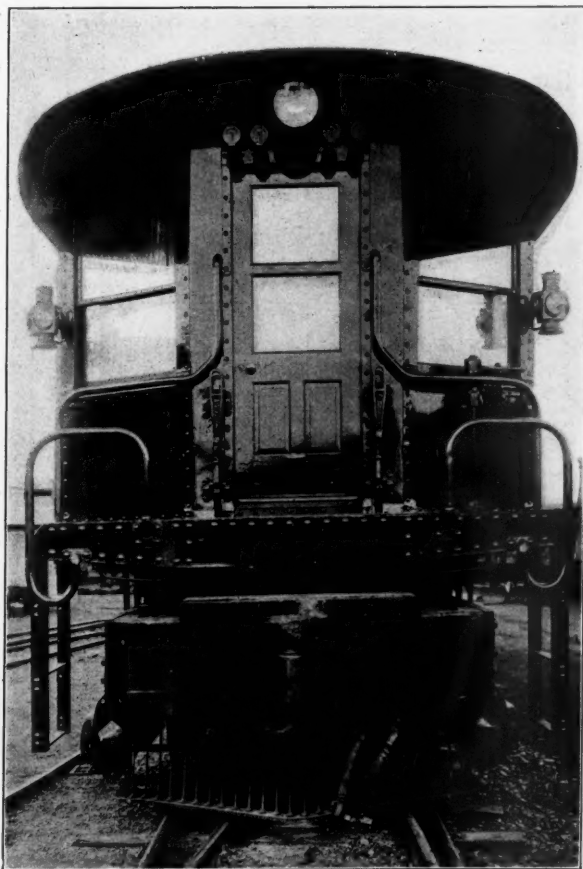
one is equipped with four 350 h.p. geared motors, and the other with four gearless motors in order that the relative merits of the two types may be determined.

The locomotive with gearless motors has one of its trucks equipped with two 320 h.p. motors supported by springs from the main journals and wholly independent of the truck frame, while the other truck has two 300 h.p. motors rigidly fastened to the truck frame. This arrangement will demonstrate the advantages of the two methods of motor suspension under the same conditions of service.

In exterior appearance the two locomotives are almost identical. They resemble somewhat a short truck passenger car with few windows and large wheels. The trucks are of the four-wheel type, having frames placed outside the wheels, with pedestal boxes and adjustable wedges similar to those used in locomotive practice. On account of their short wheel base the trucks have a tendency to tilt in operation, and thereby shift a portion of the effective load



Side View of Electric Locomotive; Pennsylvania Railroad.



End View of Electric Locomotive; Pennsylvania Railroad.

from one pair of wheels to the other. By an ingenious automatic switching mechanism the power delivered by the motor on the heavily loaded axle is increased and the power delivered by the motor on the lightly loaded axles diminished in proportion to the difference in axle loads. By this expedient the pulling power of the locomotive is increased.

The outer-end casting of each truck carries the coupler, draft spring and buffer arrangement, so that strains caused by pushing, pulling and buffing are taken directly by the truck frames and do not come upon the underframe of the cab, except as they are transmitted between bolsters through the center sill. In order to allow sufficient lateral play when the locomotive is coupled to a long passenger car with considerable overhang, the coupler head has a free movement of 15 in. on either side of the center line of the truck. To facilitate coupling and uncoupling on curves, the coupler can be swung sideways and its uncoupling pin raised by means of levers at the end of the cab, which can be operated from the platform.

Driving wheels are 56 in. in diameter, with removable tires secured by retaining rings. They are carried by axles 8 in. in diameter at the center, provided with 6-in. x 11-in. journals.

The spring rigging is of the locomotive type, with semi-elliptical springs over the journal boxes, and equalizers between the springs. To prevent teetering, the equalizer beam is not provided with a fixed fulcrum, but instead supports two nests of helical springs, which in turn help to support the truck frame.

The collector shoes are attached to the four end journal boxes, and are made of two castings forming a spring hinge, with one wing lying in a horizontal plane, and sliding on top of the third rail. The current passes from the third rail through the collector shoes and the heavy cables connected thereto to the fuse-boxes fixed near the shoes.

The cab is entirely of metal, its underframe composed of a center sill, built of two 10-in. channels, side sills of 7-in. x 3½-in. angles, plate bolsters and end sills. Within the cab the apparatus is distributed along the sides, leaving a passageway through the middle. The equipment on one side of the cab consists of three main reservoirs, a sand-box with electro-pneumatic valves underneath, a switch group, two line switches, a case of diverters, and two sets of storage batteries. That on the other side consists of a compressor, a compressed air cooler, a fan and motor, a reservoir for control apparatus, a sand-box, two line switches, a whistle reservoir, a motor cut out, a switch group, and a case of diverters.

The locomotive control mechanism is in duplicate, and placed in diagonally opposite corners of the cab, so that the motorman can operate a locomotive, or group of locomotives, from either end of the cab, in either direction. By means of a special grouping of switches it is possible to obtain a constant flow of current without a break, when changing from series to series parallel, and from series parallel to full-multiple. The preliminary tests made with the locomotive proved that by means of this system of grouping switches, the acceleration of the locomotive could be made practically uniform. Both ends of the cab are provided with sockets, so that when two or more locomotives are coupled together connections can be made by means of these sockets, and the group of locomotives can be simultaneously operated and controlled by the motorman of one locomotive.

Hung from the ceiling in the center of the cab, are two plug switches and another ammeter shunt. The conductors from the third rail shoes are connected to one switch, and the trolley cable is connected to the other.

The switches in the switch group are operated by air pressure. The air valve is actuated by a control magnet on a 14-volt circuit. When current flows through the magnet armature opens the air valve, admitting air behind the piston, which closes the switch through which the main current flows. By breaking the control circuit the armature of the magnet is released, which closes the air passage from the reservoir and prevents the egress of air from the cylinder. A spring under the piston pushes it up, and thus opens the main circuit. The line switches are actuated in a similar manner, and also open when an excess of current flows through them by the air valve, admitting air behind the piston, which closes the switch through which the main current flows. By breaking the control circuit the armature of the magnet is released, which closes the air passage from the reservoir and prevents the egress of air from the cylinder. A spring under the piston pushes it up and thus opens the main circuit. The line switches are actuated in a similar manner, and also open when an excess of current flows through them.

The cab can be lighted by three lamps, which are in series with the lamps with the headlights; but normally these lamps are to be concealed. Five more lamps, which are in series, are distributed over the ceiling, to assist in lighting the cab when repairs are under way, but are not used when the locomotive is in service.

The storage batteries are in two sets so that they can be charged alternately by being placed in series with the motor of the air compressor, one set being charged while the other set is in service, the alternation being made each day.

Locomotives are equipped with hand, straight air, automatic and high-speed brakes. The principal dimensions, which are the same for both locomotives, are:

Number of pairs of driving wheels.....	4
Diameter of driving wheels.....	56 in.
Axles.....	diameter, 8 in.; journals, 6 x 11
Length, inside couplers.....	37 ft. 10 1/2 "
Length over platforms.....	35 " 8 "
Wheel base of trucks.....	8 " 6 "
Total wheel base of locomotives.....	26 " 1 "
Width, cab.....	10 " 1 3/4 "
Width, body.....	9 " 11 3/4 "
Height, rail to top platform.....	5 " 5 "
" " " roof.....	13 " 4 "
" " " bell (extreme).....	14 " 5 1/2 "
Weight: Locomotive No. 1001 (geared motors).....	175,100 lbs.
Weight: Locomotive No. 1002 (gearless motors).....	195,200 "

Rapid Transit Conditions in New York.

The report of the Board of Rapid Transit Railroad Commissioners for the city of New York for the year 1906, presumably the last report which this body will make, since it has now been superseded in its functions by the Public Service Commission of the First District, contains much interesting data about passenger traffic in New York City and presents graphic estimates of what traffic in future years may be expected to be. We show the diagrams illustrating traffic movement, which the commission has prepared.

The total number of passengers carried in the subway during 1906 was 149,778,370, as indicated by ticket sales. The smallest number of passengers carried any one month was 8,555,795 in August, 1906, and the largest number was 15,609,516 in December. These months of minimum and maximum traffic showed increases of 41 and 14 per cent., respectively, over July, which was the month of minimum traffic in 1905, and December, the month of maximum traffic. The average number of passengers carried per month in 1906 was 12,466,786. The heaviest traffic was at the Brooklyn bridge station. Over 19 1/2 million people boarded trains at this station during the year, and if it be assumed that an equal number left the trains there, over 39 million people, exclusive of those transferring from one train to another, passed through the station. Twice as many passengers used the Brooklyn bridge station as any other single station on the road.

The 10 busiest stations in order of their importance are:

1. Brooklyn Bridge.
2. Grand Central.
3. 14th street.
4. Times Square.
5. Fulton street.
6. 23d street.
7. 116th street.
8. 125th street and Lenox avenue.
9. Astor place.
10. Wall street.

On the maximum week day, December 24, 1906, 605,246 passengers were carried.

As an indication of the future growth in the city's population, Fig. 1 shows the population of the city in its five boroughs from 1800 to 1905, as obtained from the United States and state censuses. Based upon the average rate of growth per decade, from 1870 to 1900, the curves have been extended to 1930.

Fig. 2 indicates the paid passenger traffic in New York City and its several boroughs from 1901 to 1906, inclusive, with the curves extended to 1916.

Fig. 3 shows the detailed variation in the traffic on the surface, elevated and subway lines for the same years as before. The general laws governing the variations in the population and traffic of Greater New York can best be observed by studying Figs. 1 and 2. Considering all the boroughs grouped into one great population center, it appears that during the four years ending June 30, 1905, the total number of paid passengers traveling on all street railways—surface, elevated and subway roads—increased practically in a straight line, that is, the increment in each succeeding year was about the same. During 1906, however, there was a sudden marked increase in the traffic. While the average increment for the four preceding years was only about 63,000,000 per year, during 1906 it amounted to nearly 110,000,000. No census of the population of the Greater City was made in 1906. It is therefore impossible to determine whether this large additional number of riders is due to a corresponding increase in the population, or to an increase in

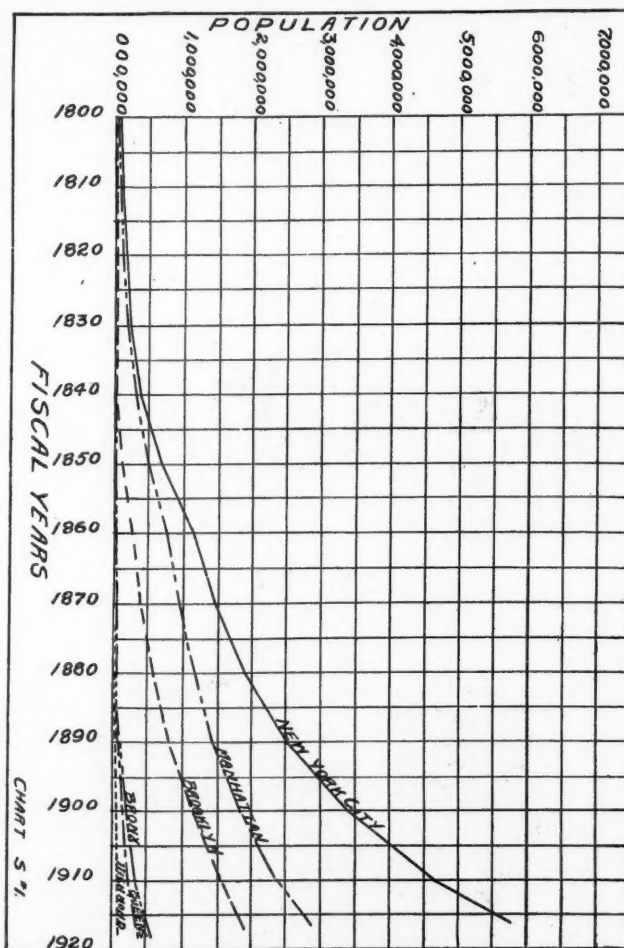


Fig. 1.

the number of riders per capita, but an increase in the population is the most probable cause, as will appear later. The growth of the travel in the boroughs separately has not always been parallel with that in the whole city, as was notably the case during the last three years. During 1902 and 1903, the increases were practically uniform in each borough; the amount of increase in each borough being greater in the order of the size of population of the boroughs—that is, the increase was smallest in Richmond and largest in Manhattan.

During 1904 and 1905, with the travel in the whole city still

increasing at a uniform rate, there was a loss in the rate of increase in the travel in Manhattan, and a corresponding gain in all the other boroughs, but mainly in Brooklyn. This may be accounted for by a temporary movement of some of Manhattan's population to the other boroughs. The only reason that can be ascribed for this migration was the interference with travel in Manhattan due to the building of the subway.

In 1906, when the notable increase in the number of paid passengers in the whole city occurred, there was a general increase in the rate of travel in all the boroughs. This was a greater rate

about 28 per cent. This borough now has on an average about two inhabitants to the acre. It is estimated that its population may be about 100,000 in 1916, or a little less than three to the acre. Approximately 60 per cent. of all the passengers in Richmond, about 26,000 per day, are now transported to and from Manhattan by ferry. The increases in population and passengers transported will probably be greater than indicated above. However, assuming that the same rates are maintained, in 1916 there should be approximately 26,000,000 paid passengers carried in Richmond. About 15,000,000 of these will have to be provided with transportation to and from Manhattan. Each inhabitant of the borough now rider 210 times per year; in 1916 he would ride about 260 times. There are now 130 miles of single track operated in Richmond. The transportation problem here can be taken care of for many years to come by the natural expansion of the present systems to develop new territory and an increase in the car mileage to meet the added demands of the growing population.

In the borough of Queens the conditions are somewhat similar to those in Richmond, except that the population is larger and has increased about twice as fast.

In 1906 the population was 208,596. The completion of the tunnels now under construction will probably cause a phenomenal growth in the population. Based on a normal ratio of growth, however, it is estimated that it will be about 300,000 for 1916. In studying the traffic, the Long Island Railroad has not been included. There were 22,115,729 paid passengers riding on the surface lines during 1906, an increase of nearly 100 per cent. during the five fiscal years, as against the 28 per cent. increase in Richmond. The number of rides per inhabitant is smaller in this borough than in any other. In 1901 there were 73 per capita per

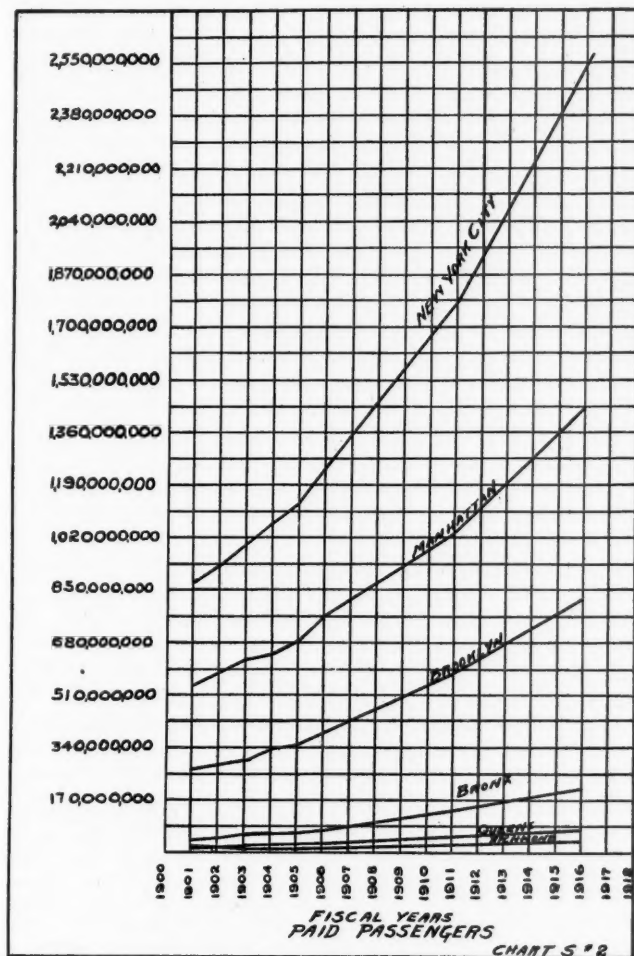


Fig. 2.

than had prevailed during any of the preceding years which have been considered. Manhattan recovered more than was lost during the years 1904 and 1905. All the other boroughs made material gains.

In the upper portions of Manhattan, a territory which was not conveniently accessible before the subway was opened, a great many apartment buildings have been erected. There has been a large movement into this district, the subway stations located here alone have handled nearly 8,500,000 passengers during the fiscal year of 1906. Assuming that most of these people have come into the city from the outlying suburbs in New Jersey, Long Island and Westchester, a total of nearly 17,000,000 additional passenger fares are accounted for on the subway alone.

It would appear, therefore, as already stated above, that the pronounced growth in 1906, in the total number of paid passengers traveling in the whole city, can only be accounted for by a corresponding increase in the city's population. This is probably due to the operation of the city's first subway, a great many suburban people having been induced to come into the city in view of the increased facilities afforded. It is now proposed to take up each borough, more or less in detail, and finally to make some speculations with regard to the transportation requirements within the next decade.

In the borough of Richmond 15,571,889 paid passengers were carried during the fiscal year of 1906; 8,957,414 of these were carried on the surface lines, the remaining 6,614,475 on the steam roads; the daily average was nearly 43,000. During the last five fiscal years the number of passengers carried increased at a fairly uniform rate. The total increase for the five-year period was

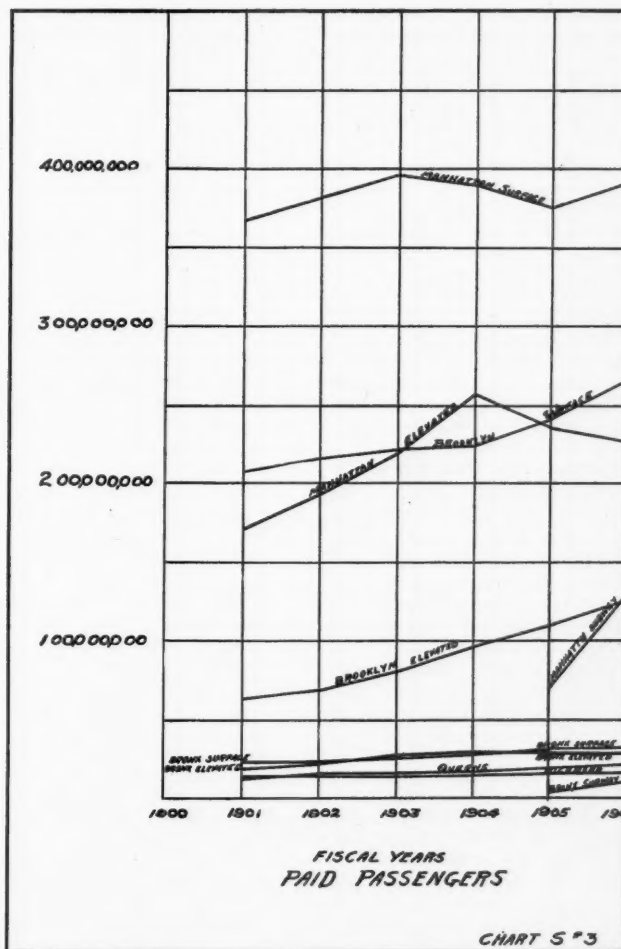


Fig. 3.

year; in 1906, 106. If the traffic increases as rapidly during the next decade as it has during the past five years, in 1916 the travel in Queens borough will equal over 88,000,000 paid passengers. To carry this traffic within the borough, as was the case in Richmond, it will only be necessary to increase the car mileage as occasion demands, and to add to the trackage in undeveloped territory. This does not dispose of the passengers whose objective point is Manhattan; these must be provided with facilities for crossing the East river.

The statistics are not directly available from which the number

of people bound to Manhattan can be determined. It has been estimated, however, that about 60 per cent. of the riding passengers both in Richmond and in Brooklyn cross to and from Manhattan each day. Using this same ratio, then about 53,000,000 people, exclusive of Long Island Railroad passengers, will have to be transported across the East river from Queens in 1916, either by ferries, bridges or tunnels.

The Blackwell's Island bridge and six tunnels are now being constructed between Manhattan and Queens. Two of the tunnels enter Manhattan at Forty-second street and are known as the Belmont tunnels; the other four are the Pennsylvania tunnels through Thirty-second and Thirty-third streets. The bridge provides for two elevated and two trolley tracks; in all there will be five tracks in each direction. The Pennsylvania tunnels will probably be used mostly by Long Island commuters. If these tracks are omitted from consideration three tracks in each direction will still be available for the use of this borough. These facilities should be in operation within four years. Their combined maximum capacity should be over 133,000,000 per year, with a maximum hourly capacity of over 73,000 in one direction. If all passengers are to be provided with seats, then the above figures would become approximately 60,000,000 and 33,000,000, respectively. The residents of Queens will therefore have ample facilities for reaching Manhattan for many years to come.

During the fiscal year of 1906 389,555,025 paid passengers were carried on the street railways in the Brooklyn borough, a daily average of over 1,067,000. This represented 278 rides per inhabitant for the year.

The elevated lines carried 125,221,831 and the surface lines 264,333,194, or about 32 and 68 per cent., respectively, of the total number. Over 60 per cent., or approximately 234,000,000, of all of the above passengers were carried to and from Manhattan over the bridges and ferries. There has been a slight increase each successive year in the rate of increase of the total passengers carried. Considered separately, the riders have increased faster on the elevated than on the surface lines.

The number of surface riders in 1906 was about 27 per cent. greater than in 1901. During the same period the amount of single track operated has increased less than 2 per cent., and the car mileage only about 11 per cent. This has resulted in a greatly increased crowding on all lines. For the same five fiscal years the population has grown less than 18 per cent. Each inhabitant has taken 189 rides on the surface cars during 1906, as compared with 174 rides during 1901.

If the same rates of increase which have prevailed during the past five years are maintained for a decade, in 1911 the number of paid passengers carried on the surface roads in Brooklyn will amount to about 336,000,000; in 1916, to about 426,000,000.

These figures do not represent the maximum rates at which passengers will have to be carried during the rush hours. During these hours it is estimated that transportation will have to be provided on the surface lines at the rate of over 100,000 per hour in one direction in 1911, and 140,000 per hour in 1916.

The travel on the elevated railroads in Brooklyn has very nearly doubled, while the surface roads were gaining 27 per cent. To carry this enormous increase of traffic only 9.346 miles of single track have been added, or only 11 per cent. more than was operated in 1901. The car mileage during the same period has not increased 60 per cent. It appears, therefore, that the increase in facilities on the elevated railroads has not kept pace with the growth in the traffic. The whole transportation system, both surface and elevated roads, is greatly overburdened. It is obvious that in order to provide relief for Brooklyn's population the subway systems must be extended into and through the borough as quickly as possible. When this is done the surface lines will be greatly relieved; they can then be depended upon to fulfil their proper functions, that is, furnish the necessary short-haul service. Long-distance passengers will be provided for on the elevated and subway lines. The capacity of the present surface and elevated lines is about 280,000,000, if moderate crowding is permitted during the rush hours.

From careful estimates it is believed that not far from 560,000,000 paid passengers will have to be provided with transportation in Brooklyn on all lines during 1911, and 800,000,000 during 1916. Deducting the capacity of the present facilities, subways should be built by 1911 to accommodate 280,000,000 people, and by 1916, 520,000,000 people.

To furnish this service with only moderate crowding, one four-track railroad operating ten-car trains should be completed across the East river and into Brooklyn within the next five years; and one more within five years afterwards, or two altogether during the next decade.

If, however, all passengers are to be provided with seats during the rush hours new subways must be provided for 370,000,000 passengers by 1911, and 610,000,000 by 1916, or two four-track railroads must be constructed to Brooklyn within the next five years, and four within the next decade.

The population of the Bronx borough at the end of the fiscal

year 1906 was 288,417. It has grown over 38 per cent. during the last five fiscal years. During the same period the number of paid passengers carried on the surface lines, or, it may be said, the travel within the borough, has increased at a uniform rate of more than 36 per cent. The corresponding increase in the passenger car mileage has been less than 27 per cent., consequently the service now provided is not as good as it was five years ago. The trackage is sufficient, and adequate surface car transportation in this borough can be furnished for some years by increasing the car mileage or number of cars in use.

The elevated and subway traffic in the borough represents the travel to Manhattan. The number of paid passengers using the elevated road increased at a uniform rate up to 1904. The next year there was a very slight increase, due wholly to the opening of the West Farms branch of the subway, which had been in operation for seven months. In 1906 the use of the subway caused a falling off in the number of elevated passengers. Apparently the subway has had no effect upon the travel on the surface lines in The Bronx. Probably about 42,000,000 paid passengers will be carried on the surface lines in 1911, and 57,000,000 in 1916.

Manhattan's population was 2,167,585 for the 1906 fiscal year. This represented an increase of about 15 per cent. in five years. The traffic on all the lines in the borough has increased nearly 39 per cent. during the same time, but the growth has not been uniform throughout the whole period. The percentage of increase for each succeeding year was less than that for the preceding year up to 1905. For 1906, as already stated, there was a marked increase in the travel on all lines. While in each year the total travel has increased over that of the preceding year, the same thing cannot be said of the surface, elevated and subway lines when considered separately. During 1902 and 1903 there was a steady increase in the number of paid passengers carried on both the surface and elevated roads. In 1904 there was a falling off on the surface lines and a corresponding increase on the elevated lines. This was probably due almost entirely to the interference with the surface cars caused by the construction of the subway. But the surface and elevated lines showed a loss in 1905, which combined was equivalent to the travel on the subway during that year. Most of the subway passengers, however, were drawn from the elevated lines. There were nearly 21,000,000 less passengers using the elevated than in 1904—a loss of 10 per cent., instead of what should have been a gain of nearly 20 per cent., due to the subway travel. During 1906 the surface roads gained a little over the previous year, but the elevated roads continued to lose passengers.

In the fiscal year of 1906 the surface cars in Manhattan carried 391,354,877 paid passengers. This was a total increase of about 7 per cent. in five years. It has already been shown that the population of the borough increased 15 per cent. during the same period. Each inhabitant rode 194 times during 1901, as compared with 181 times in 1906. It is therefore apparent that the public are not riding on the surface cars as often as formerly. There are several reasons for this. The subway traverses a section of the city which had not formerly been provided with rapid transit facilities; therefore, those who had been compelled before to use the surface cars immediately changed to the subway. Again, a great many have moved their homes from lower Manhattan into upper Manhattan and The Bronx, and in consequence have become patrons of the elevated and subway roads. The number of passengers carried in 1906 does not represent the maximum number carried per year during the last five years. In 1903 there were 396,570,435 surface car passengers, amounting to nearly 200 rides per capita. This was the summit year of the surface car travel. The changes in the trackage and car mileage have not corresponded with the variations in the traffic. The former has increased about 14 per cent., but the latter only about one-half of 1 per cent. The density of traffic, or number of paid passengers per car mile, has increased over 6 per cent.

At present, if there were greater facilities for the long-distance travel, the traffic on the surface lines would be materially less. The surface lines should be wholly available for the short hauls. If the traffic growth on these lines for the five years just past is maintained for a decade the paid passengers would then be about 419,000,000 in 1911, and 448,000,000 in 1916. This number can probably be taken care of on the present surface lines without excessive overcrowding, provided the street conditions are so regulated as to reduce to a minimum the obstruction to car movement, and the size of all the cars in service is increased to the dimensions of the largest cars now being used. It would be of great benefit if the movement of vehicles on the car tracks were prohibited, or at least restricted, particularly during the rush hours. Careful investigations made by the Merchants' Association during 1903 will confirm these statements.

It has already been pointed out that a large number of former patrons of the elevated changed to the subway as soon as it was opened. The elevated and subway roads in Manhattan are considered together, since they both provide for the long-distance travel. The combined traffic on the two systems during the fiscal

year ending June 30, 1906, was 355,331,924 paid passengers, 227,538,369 riding on the elevated roads, and the remaining 127,793,555 using the subway. In five years the number of long-distance riders has increased over 108 per cent. The number of such riders per inhabitant has been 91 for 1901, and 164 for 1906. The enormous gain indicated above was accompanied by a corresponding loss on the surface lines. It is unlikely that such an increase in the elevated and subway traffic will be maintained for more than a few years at the most; it merely represents a change from one system to another. The more nearly correct conditions will be shown in the increase in traffic on all lines. Moreover, since Manhattan and The Bronx are interconnected by both the elevated and subway lines, it will be desirable to consider these two boroughs together in arriving at any conclusion relative to the traffic on these two systems.

The population of Manhattan and The Bronx has been estimated at 2,456,002 for the fiscal year 1906. It will probably be about 2,740,000 in 1911, and 3,170,000 in 1916. The total paid traffic for the last five fiscal years has increased about 41 per cent., to 818,273,413 per year, or an average of about 2,242,000 per day. The number of rides per capita is now about 333. The above total paid passengers are distributed as follows: Surface lines, 422,567,025; Elevated lines, 257,786,756; Subway, 137,919,632. The

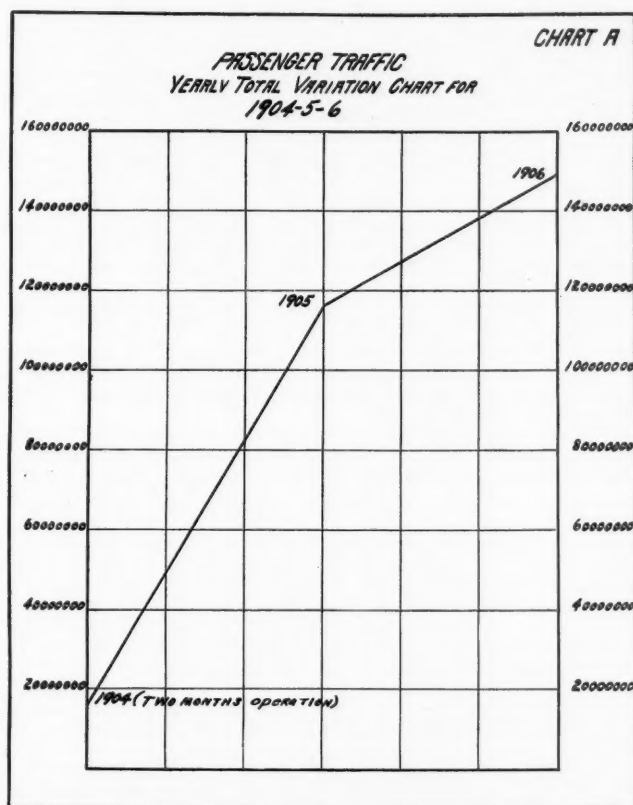


Fig. 4.

surface lines carry about 52 per cent. of the total traffic, and the elevated and subway lines together the remaining 48 per cent. It appears therefore, that at present in Manhattan and The Bronx the traffic is about equally divided between the surface roads in one case and the elevated and subway in the other, while in Brooklyn and Queens only about one-third of all passengers were carried on the elevated lines.

At the 41 per cent. rate of increase for five-year periods the total traffic in Manhattan and The Bronx will be about 1,153,000,000 in 1911 and 1,626,000,000 in 1916, daily averages of 3,131,000 and 4,454,800. Transportation must be provided for the rush hour conditions, or maximum number carried in one hour in one direction. The capacity of the existing elevated and subway roads, based on such conditions, if all passengers are to have seats, is not far from 200,000,000 per year; if moderate crowding is to be permitted, about 300,000,000. The estimated number of surface car riders has already been stated—for Manhattan, as 419,000,000 in 1911, and 448,000,000 in 1916; for The Bronx as 42,000,000 in 1911, and 57,000,000 in 1916. Deducting these figures and the estimated capacity of the existing elevated and subway lines from the total estimated traffic to be taken care of in 1911 and 1916, we have either, when seats are furnished, 492,000,000 and 921,000,000, or, with moderate crowding, 392,000,000 and 821,000,000 passengers,

respectively, for whom transportation must be provided in new subways yet to be constructed.

Under moderate crowding two additional subways must be completed within five years and four within ten years. If seats are to be provided three additional four-track subways will have to be put in operation within the next five years, and three more within a decade, in order that the inhabitants of Manhattan and The Bronx may be transported to and from their daily business in comfort and decency.

The Railroads of Mexico.*

BY ERDIS G. ROBINSON, C.E.,

Formerly of the Engineering Department of the Mexican Central.

V.

(Concluded.)

OPERATION.

As the railroads of Mexico have been located and built by American engineers and contractors, so have they been managed by men who have been thoroughly schooled in the services of the large companies of the United States. In Mexico, however, they have found problems and conditions not encountered in their previous experience, at least not in equal degree; and this was to have been expected when is considered the different national, natural and racial conditions. In the following table is given an analysis of the operating expenses of the roads of the two countries by means of which a comparison may be made. The figures for the Mexican roads are obtained by averaging data taken from the reports of the Mexican International, the National of Mexico, the Mexican Central Ry., and the Mexican Railway. The figures in the second column are taken from reports of roads operating in the western part of the United States through regions where prevail conditions most closely resembling those of Mexico. The third column gives figures (taken from Mr. Wellington's well known book written many years ago) to represent the railroads of the entire United States.

TABLE II.—Operating Expenses of Mexican and American Roads.
Percentages due to different accounts.

Account.	Mexico.	Pacific roads (U.S.).	U. S. (A.M.W.)
Locomotive expenses: Fuel	26.3	11.0	7.6
" " Water	1.3	0.6	0.4
" " Oil and waste	0.8	0.8	0.8
" " Repairs	7.4	8.0	9.2
Total locomotive expenses	35.8	20.4	18.0
Car expenses: Supplies	1.0	1.6	0.5
" " Repairs	8.6	7.5	10.0
" " Mileage	0.4	2.0	2.0
Total car expenses	10.0	11.1	12.5
Wages account: Locomotive	8.0	10.0	6.4
" " Cars	5.4	8.0	8.5
" " Switching	1.8	2.5	1.6
Total wages account	15.2	20.5	16.5
Track expenses: Rails	1.2	3.0	2.0
" " Adjusting	6.3	9.5	10.0
" " Ties	5.0	5.0	3.0
Total track expenses	12.5	17.5	15.0
Miscellaneous and general	26.5	30.5	38.0
	100.0	100.0	100.0

Referring to this table (Table II.) it will be seen that the locomotive account for the Mexican roads shows 75 per cent. heavier than for the Pacific roads and double that for the roads of the entire country. The figures for oil, waste, repairs, etc., are almost identical for the three columns, the difference being in the water and fuel accounts.

The high cost of locomotive fuel is due to the scarcity of coal lands in Mexico. Aside from the fields adjacent to the line of the Mexican International in northeastern Mexico the roads must rely on coal imported from England and the United States, the cost of which is necessarily high, due to foreign costs and long haul. During the early years of the operation of the Mexican Central its coal was hauled from El Paso, a distance of 1,220 miles from its southern terminus. This not only added very materially to the cost of coal but affected the hauling capacity of the road. Many locomotives are equipped for burning wood, though this source of fuel is rapidly diminishing so that branch lines are built and extended to tap new timber areas. The Mexican Central following the exploitation of the oil fields located on its San Luis division, is operating some of its locomotives with this fuel and will add to their number as future developments may seem to justify. For the year ended June 30, 1905, this road expended for fuel amounts distributed as follows:

For coal	3,851,043 pesos.
" wood	765,868 "
" oil	998 "

During this time the use of oil was in the experimental stage, but

*The first article was published in the *Railroad Gazette* of July 12, 1907; the second, in the issue of Aug. 9; the third in the issue of Aug. 30; the fourth in the issue of Sept. 6.

the figures give an idea of the proportion of coal and wood used by that road.

The table gives the part of the operating expenses due to locomotive fuel. To consider the matter in a different light we find that on the Mexican roads the receipts for each dollar spent for locomotive fuel is \$6.35 while for the roads in the United States the receipts are \$12 for each dollar.

Likewise the high water account indicated a scarcity of water along the lines of the Mexican roads. In truth this matter of water supply is one of the vexatious problems. Long stretches of roads cross arid areas where rain falls at intervals possibly of several years, and though ever increasing efforts are being made to provide wells, reservoirs and pipe lines, still there are sections of roads where water stations cannot be provided, and it becomes necessary to haul water in tank cars, not only for locomotive use, but also to supply the stations and section-houses along the lines. Since every car thus hauled means one car less of revenue freight, the operating capacity of the road is at once affected as with long haul on coal cars. It is true that this condition is not uncommon on some of the roads in the southwestern states, but it is believed does not prevail so generally, as one will be led to think from noting the proportion of water service cars in use in the different cases.

These conditions, which cause such high locomotive fuel and water expenses, bring the total locomotive account on the Mexican roads to the high figure already noted. It will be noticed that costs of locomotive oil and repairs show almost no difference, as would be expected.

Passing to the second part of the table, car expenses, it will be of interest to observe the difference in car mileage, the ratio of these accounts being 1:5, and this comparison includes only the standard gage lines of the Mexican roads.

The third division offers an interesting comparison but is difficult to analyze, since the figures depend upon so many contributing influences. It will be noticed that on the American roads this item totals 25 per cent. above that for the Mexican roads, and that the car wages are 33 per cent. higher, while locomotive wages are but 20 per cent. above the Mexican charges. It would seem that the lower wage rate prevailing in Mexico would account for this difference, all the more since there is a larger proportion of natives employed in the car service. These facts are stated more in detail in the following tabulation:

TABLE III.—Analysis of Wage Account.

Class of wages.	Per cent.			
	Tot'l operat'g expenses—		Wage account.	
	Mexico	U. S.	Mexico	U. S.
Wages of locomotives	8.0	10.0	52.5	48.8
Wages of car service	5.4	8.0	35.5	39.0
Wages of switching act.	1.8	2.5	12.0	12.2
	15.2	20.5	100.0	100.0

However, the amount in the wage account does not vary uniformly with the wage rate, since the efficiency of the labor must be considered, nor with the tonnage hauled. These points and others may be gathered from the few miscellaneous figures tabulated in Table IV., as well as the futility of attempting to discover a general rule involving these figures.

In the subdivision giving track expenses there will be noticed a considerable difference in the cost of adjusting track, due again to the lower wage rate in Mexico where all the section men and foremen and many of the roadmasters are Mexicans, and to the lighter tonnage of traffic over the Mexican roads.

TABLE IV.—Miscellaneous Data.

	Mex. Ry.	Nat. of Mex.	Mex. Inter.	Mex. Central.	U. S. roads.
Average haul, freight-miles	116	165	210	237	..
Train load, tons	93	240	202	282	335
Employees, per mile .....	..	343	273	407	637
Per cent. Mexicans .....	..	93.3	77.8	88.3	..

It is believed that the differences shown in the table (Table II.) are typical although equal differences may be noted between roads in different parts of the United States. It should be added that the figures for general and miscellaneous expenses include items which if strictly classified would come under some of the special headings, and that it has been the intention to note differences between certain well defined accounts.

The reports as made by railroads usually give a summary of operating expenses classed under four headings, namely, Maintenance of Way, Maintenance of Equipment, Conducting Transportation and General Expenses. In the following list this classification has been followed, and it will be noted that there is no very vast difference indicated in the table.

	Roads—	
	Mexican.	U. S.
Maintenance of way	15.8	19.8
Maintenance of equipment	19.2	20.7
Conducting transportation	57.5	55.5
General	7.5	4.0

It would be expected that the various conditions noted would tend to increase operating expenses of the Mexican roads. It has been shown that the locomotive expense is greatly in excess of the same account on roads in this country, and would more than counterbalance the evident saving in wages and maintenance expenses.

There are other factors which would tend to cause heavy operating expense: The topography of much of the country is such as to lead to heavy construction expense and consequently to a high interest account, and this notwithstanding the liberal subsidy payments provided by the Mexican Government amounting at times to 10 per cent. of the total national expenditures; and also in past years the effect of the fluctuating currency on the earning capacity of the roads. It would seem then that these factors tending to increase the operating expenses of the roads would result in higher freight or passenger rates if the operating ratio is to be maintained at a figure approximating that prevailing in this country. The degree of approximation is shown in the following list:

	Mex. Ry. of Mex.	Nat. Inter.	Mex. Central.	Mex. U. S. roads.
Ratio operating expenses to earnings	61.4	64.9	58.7	67.4

This leads naturally to a brief discussion of the matter of rates charged on the Mexican roads as compared to rates charged on roads in this or other countries, and the following figures are taken from such reports as are accessible:

	Receipts—			Receipts—	
	Freight, per ton-mile, cents.	Pass'g'r, per pass.-mile, cents.		Freight, per ton-mile, cents.	Pass'g'r, per pass.-mile, cents.
Mex. Inter.	1.09	1.85	United States ...	0.77	1.96
Nat'l of Mexico ...	1.48	1.85	France	1.31	...
Mexican Ry.	2.18	1.60	Germany	1.2	...
Mexican Central ..	1.11	....	Austria	1.3	...

From this tabulation it will appear that the freight rates in Mexico are very high as compared to the passenger rates of that country, being more per ton per mile than passenger per mile; that freight rates are somewhat higher than freight rates in this country, though comparing not unfavorably with western roads, and those rates prevailing in European countries; and that the passenger rates are much lower on the Mexican roads. The low passenger rate is mainly due to the large proportion of third class passengers for which service the rates are not more than one-half those charged for first class passage, although the charge probably covers all that the service is worth. On the Mexican International, whose report covers this matter, the third class coaches carry 65 per cent. of the total number of passengers; while on the Mexican Railway the percentage is 76, and on the Mexican Central 73.

It must not be forgotten in this connection that the rates charged by the Mexican roads are subject to the approval of the Government and are fixed only after an agreement between the Government and the railroad companies.

When considering the railroads of Mexico many are inclined to think of them as being dependent upon their business relations with the United States. This is true to the extent that we are always dependent upon our neighbors either as individuals or as nations, and is equally true as to the United States. It is a fact, however, that those Mexican roads built to develop the resources of that country are the most prosperous properties, as the following figures may seem to indicate. The table gives the classification of freight traffic on four of the Mexican roads.

Classification.	Mex. Ry.	Mex. Central.	Nat. of Mex.	Mex. Inter.
Forest products	5.2	11.0	16.0	6.1
Agricultural products ...	41.5	21.9	22.4	11.0
Animal products	1.9	3.8	2.9	2.1
Mineral products	26.3	54.0	46.3	75.5
Manufacturing, mdse, etc.	25.1	9.3	12.4	5.3
International freight	27.1	34.8	...	...

As a side remark it may be added that an examination of the figures forming the foundation of this table discloses some interesting facts. It will be noticed that the Mexican Railway (Vera Cruz line) handles the greatest proportion of agricultural tonnage. This will be explained by the fact that the largest maguery fields of the republic lie adjacent to this road, and that the pulque, that great national tippie produced from this plant, makes up 42 per cent. of the total agricultural tonnage. It follows from this that there would result a shrinkage of 17 per cent. in the total freight business of the road if the country were to enforce a prohibition law—a contingency however, let us hasten to add, which is in no immediate danger of coming to pass. Another very noticeable figure in the table is that giving proportion of mineral tonnage on the Mexican International. Seventy-six per cent. of the mineral tonnage of that road is made up of product of coal mines, coal amounting to 57 per cent. of the total tonnage of the road.

A commission appointed by the Swiss Government to determine the amount of power which would have to be generated to operate all of the railroads in Switzerland by electricity has reported that the maximum daily consumption at the wheels would be 1,200,000 h.p. hours. This would be equivalent to 3,000,000 h.p. hours generated at the turbines, or a continuous mean output of 125,000 h.p., with 40 per cent. efficiency of transmission. The ratio of mean to maximum load is estimated at 1 to 5 so that an installation of 625,000 h.p. would be required. The State Railroads and the St. Gotthard, operating 1,690 miles, would consume 90 per cent. of the total energy generated.

GENERAL NEWS SECTION

NOTES.

A press despatch from Knoxville, Tenn., says that the Southern Railway is to lay off 1,000 men from its shops, 400 of these being at shops in that city.

In Hinds county, Mississippi, the Illinois Central has been indicted by the Grand Jury for issuing passes to persons not entitled to them, in violation of a law of 1884.

At Little Rock, Ark., September 9, a fine of \$10,000 was imposed on the St. Louis, Iron Mountain & Southern for illegally issuing free transportation to members of the legislature two years ago.

The Attorney-General of Wisconsin holds that chapter 402 of the laws of 1907, the "Full-Crew law," requires that there shall be two brakemen on every passenger train of more than three cars.

The State Railroad Commission of Oregon has issued an order requiring the Southern Pacific to run an extra train in place of No. 12, from Roseburg to Portland, 198 miles, whenever No. 12 is two hours or more behind time. A similar order has been issued in relation to certain trains between Portland and Pendleton, 231 miles.

The Waverly (N. J.) Transfer of the Pennsylvania Railroad (near Newark) sorts package freight into 250 cars daily which are despatched to 121 different points west and south. All this is fast freight. As each train from New York or the East is switched into Waverly a small army of 210 loaders transfer its contents piece by piece to the 200 cars drawn up along the platform. A force of 199 clerks is kept busy all the time on this work and that of the full car lots which also go through Waverly.

Charles Alfred Johnson, a fireman on the Bradford division of the Erie Railroad, has received from General Manager J. C. Stuart a complimentary letter, accompanied by a handsome gold watch and chain, sent in recognition of Mr. Johnson's courage and coolness in the management of a runaway freight train one night last March. The train, which was a long one, became uncontrollable on a steep descending grade and the engineman, finding that the air-brakes did not hold, jumped off. He advised the fireman to follow, but Johnson concluded to stick to the train. He reversed the engine and then went back and assisted the brakemen in setting hand-brakes for 2½ miles. The train was wrecked at a derailing switch and Johnson was buried under the wreckage for four hours, but came out only slightly injured.

Governor Warfield on the Southern Situation.

Governor Warfield, of Maryland, in a recent address at the Jamestown exposition, took a conservative position with regard to legislative activities in the South. He said, in part:

Baltimore has contributed of her capital and her enterprising men to this great development of the South, and has invested over \$200,000,000 in southern railroads, southern cotton mills, southern street railways, southern coal mines, timber lands, and factories. Her financiers and capitalists have had faith in the integrity and credit of the South. The question confronting us to-day is, shall that confidence be destroyed? Has it been shaken by the recent attitude of some of the people of the South toward corporations and corporate interests?

If the South is sure of herself, and will need in the future no outside capital—if she has resources of her own sufficient for her further development—then the course these people are pursuing may prove all right, though it seems to me that your local capital needs exactly the same protection that outside capital requires, and that without this it will not seek investment in the development of your matchless resources. But if she does need outside financial aid, then they are doing their best to kill the goose that has been laying the golden eggs.

Don't forget that the bonds and mortgage securities of the South to-day represent actual money. There is very little fictitious valuation. I can say from personal knowledge and experience in connection with these investments, and on the testimony of our most conservative financiers, that the water has been squeezed out and we have now the substance.

And these bonds and securities are held by your people and by our people, by your institutions and by our institutions, and by capitalists who have supplied to the South the means by which it has wrought its new prosperity. So it follows that you cannot touch the securities without at once affecting your own people and your own best interests, and the favor and steadfastness of those who have helped you through all the years.

It happens that I belong to the political party which is dominant throughout the South, and that I believe firmly in its tenets, but I do not believe in the antagonism which has arisen in some

sections to assail and harass capital, and to make harder the future of our beautiful South in its efforts to realize the destiny that belongs to its people, and its exhaustless natural wealth. And when I say this, I do not wish to be understood as referring, in any sense, to the state executives who have fearlessly taken care that the laws of their respective states are obeyed. By all means, let us see that the laws are enforced, and that the guilty are punished, be they rich or poor, high or low. But let us not be unmindful of the dangers that come from mere crusades that appeal to public clamor and take no thought of the morrow.

I take no stock in the idea that great organizations of capital are manned by bands of criminals. I believe that with but few exceptions their executive officers are loyal citizens who are anxious to correct mistakes in methods and to do what is right and obey the laws.

Entertainment Committee, 1908, M. C. B. and M. M. Conventions.

At a meeting of the Executive Committee of the Railway Supply Manufacturers' Association at Atlantic City in June last, the General Chairmen for the several committees for the 1908 M. C. B. and M. M. conventions were appointed. Chas. P. Storrs, of the Storrs Mica Co., Owego, N. Y., was named as General Chairman of the Entertainment Committee. As it is necessary for this committee to do much of its work prior to the meeting in June next, Mr. Storrs has already selected his staff, which will consist of the following: Herbert Self, Crandall Packing Co.; E. H. Walker, Standard Coupler Co.; J. Will Johnson, Pyle-National Electric Headlight Co.; S. W. Midgley, National Car Coupler Co.; Bertram Berry, Heywood Bros. & Wakefield Co.; Cornell S. Hawley, Consolidated Car Heating Co.; F. O. Brazier, Murphy Varnish Co.; A. G. Langstron, Jenkins Bros.; Ross F. Hayes, Curtain Supply Co.; C. M. Garrett, Farlow Draft Gear Co.; J. L. Connors, Ralston Steel Car Co.; Geo. H. Forsyth, Forsyth Brothers Co.; W. J. Walsh, Galena-Signal Oil Co.; H. E. Oesterreich, Wendell & MacDuffie; John M. Stayman, Gold Car Heating & Lighting Co.; Philip J. Mitchell, Philip S. Justice & Co.; Leonard J. Hibbard, American Brake Shoe & Foundry Co.; J. S. Seabury, Massachusetts Mohair Plush Co.; E. V. Stebbins, General Storage Battery Co.; T. C. DeRosset, The T. H. Symington Co.; Edw. D. Welles, Chas. H. Besley & Co.; J. C. Younglove, H. W. Johns-Manville Co.; Richard S. Chisolm, *Railroad Gazette*, and Clayton W. Old, American Blower Co.

Education of Apprentices on the Santa Fe.

The Atchison, Topeka & Santa Fe has established a system of instruction and training for apprentices along the lines of the system which has been so successful on the New York Central Lines. F. W. Thomas, hitherto Engineer of Tests, has been placed in charge, with the title of Supervisor of Apprentices. There will be established at each shop on the system a regular course of instruction with an apprentice foreman or instructor in charge, who will devote his entire time to the apprentices. Careful and regular instruction in all of the practical work essential to a proper mechanical training will be given the boys. Also they are to receive instruction in shop arithmetic and the rudiments of mechanics and mechanical drawing. The company will provide the lesson papers, reference books, drawing instruments, boards, sketch books, etc., free of charge. The school sessions will be held three times a week, for the first two hours of the day, wages being paid the same as while at work. The system is now being established at the Topeka shops, the largest on the Santa Fe, and will be extended to the others as fast as practicable.

Care will be exercised in the selection of the apprentices. They must be physically and morally acceptable. They will be taken on six months' probation. If at the end of that period they appear possessed of the necessary qualifications they will be permitted to proceed. If they appear to be suited better for some other branch of the service they will be transferred. If unsuited to railroad work of any character, they will be dropped.

New Testing Laboratory.

Gulick-Henderson & Co., Inspecting Engineers, Pittsburgh, Pa., have established at 439 Third avenue, Pittsburgh, a laboratory for chemical and physical tests of metals, coal, coke, clay, etc., using methods similar to those of the United States fuel testing plant. In a circular recently issued, the firm emphasizes its policy of personally supervising the manufacture of the product to be inspected and also supervising the work of their own inspector while the manufacture is going on. J. W. Henderson began work in the iron and steel business in 1887 in the laboratory of the North Chicago

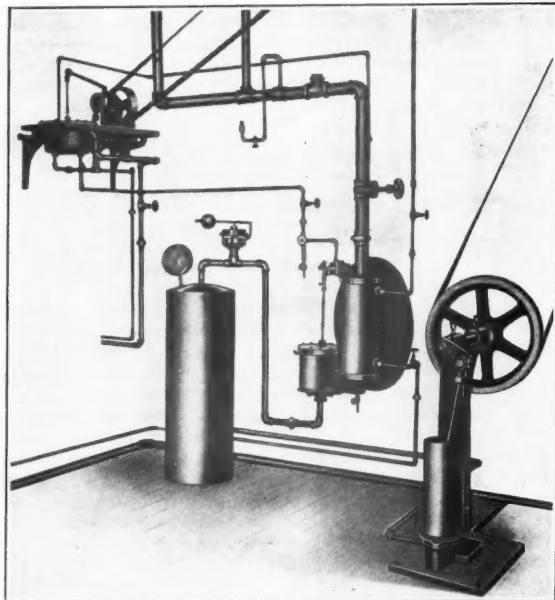
Rolling Mill Company. He was for some time Superintendent of the Cleveland Car Wheel Co., McKees Rocks, Pa., and then became Manager of the Butler Car Wheel Company's plant at Butler, Pa., where he remained until going into business for himself. Henry Gulick, Jr., has for the last six years been in charge of the inspection of railroad equipment near Pittsburgh for Robert W. Hunt & Co., Chicago.

Fines Railroads for Not Watering Stock.

The foregoing headline, taken from a daily paper, does not refer to action taken by the New York State Public Service Commission in connection with the Wall street operations of the New York-Chicago All-Electric Air Line; neither has it any connection with the fattening of stock (or bonds) alleged to have been perpetrated by Mr. Harriman; it is the action of Judge Hazel in the United States Circuit Court in the cases brought by the Government against the Lake Shore & Michigan Southern and the New York, Chicago & St. Louis for violating the law providing that cattle shall be fed and watered and given a rest every 28 hours. The railroads pleaded guilty and were fined \$2,000 and \$800 respectively. On the next day Judge Hazel imposed fines of \$800 on the Grand Trunk, \$200 on the Erie, and \$200 on the Wabash for violation of the same law.

The United States Gas Machine.

An efficient individual gas plant for factory and shop use is shown herewith. It is designed to use without waste or residuum either crude distillate or gasolene of 58 to 65 deg. specific gravity, yielding a high degree of heat under any pressure desired. The gasolene is stored in a tank of 100 to 500 gals. capacity buried in the ground, and is pumped to the small tank shown in the illustration. The pump is automatic, permitting only 2 qts. of gasolene inside the building at one time. Exhaust steam is used in vaporiz-



United States Gas Machine.

ing the fluid and a perfect bunsen flame is delivered by the burners without the use of air mixers on them. The machines are made in sizes capable of supplying 250 to 2,000 ft. of gas an hour. They have been approved by the National Board of Insurance Underwriters.

The plant may be installed in any building, or on a car for portability, and delivers gas at any pressure desired through a single line of pipe or hose. Three machines of the type shown are in use at the Hicks Locomotive & Car Works, Chicago Heights, Ill., with satisfactory results. Three locomotive tires can be expanded and removed in four minutes without disturbing wheels or trucks. Welding and forging are also done more quickly and cheaper than by methods previously used. The machines are made by the United States Gas Machine Co., Muskegon, Mich., successor to the Garland-Vila Manufacturing Co., and have been perfected within the past two years.

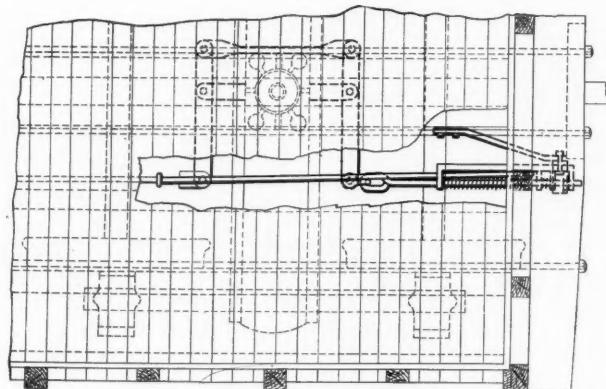
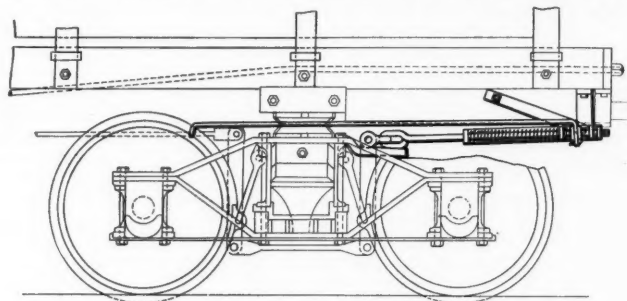
The Atlas Slack Adjuster.

The Atlas slack adjuster, shown in the accompanying engravings, is designed to be positive in action, simply made of few parts, easily maintained and of low first cost. It works on an entirely different principle from most of the slack adjusters now in use, one adjuster being attached to the car body near each end and connected by a take-up rod with the free end of the truck dead lever. This take-up rod passes through a single holding clutch composed of a perforated case-hardened steel dog, fulcrumed on the head of a bolt and automatically forcing the take-up rod through this clutch as the brake shoes wear down, so as to take up slack and shorten up the connection to the dead lever. This take-up operation is accomplished by a second friction clutch sliding on the take-up rod, and



The Atlas Slack Adjuster.

normally held in one position by a strong spring. This take-up clutch has a lost motion connection through a reach rod to the live lever or top rod. When the live lever moves beyond a predetermined maximum distance at any brake application it exceeds the limits of lost motion in the reach rod connection and pulls the take-up clutch along the take-up rod, compressing the spring. When brakes are released, the spring expands and the take-up clutch, gripping the take-up rod, is carried back to its original position, forcing the take-up rod through the holding clutch to a new position of ad-



Application of Atlas Slack Adjuster to Pennsylvania Railroad Stock Car.

justment. The holding clutch holds the rod and the connected dead lever in this new position, which is the correct one to preserve the standard brake-shoe clearance and piston travel, until the shoes wear down more, when the adjuster again comes into action to take up the slack.

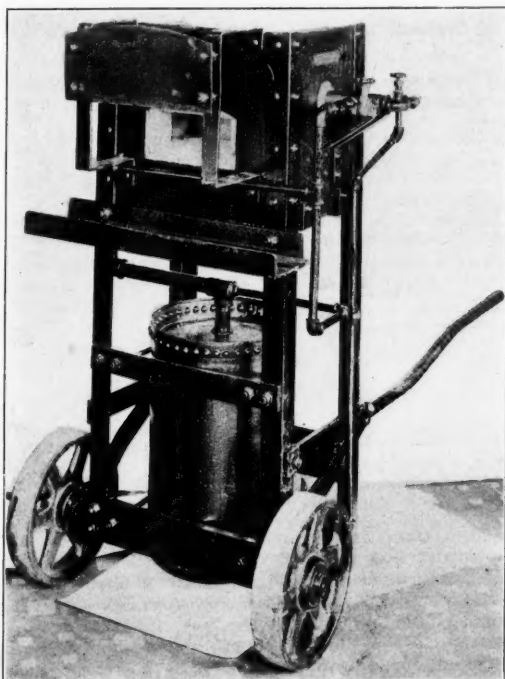
The principal advantages claimed for the device over other types of ratchet adjusters attached to the piston rod or brake cylinder are: It takes up slack on the truck where the slack appears without disturbing any other part of the brake rigging. It maintains running piston and hand brake travel at the adjustment made when the car is standing still. Exactly the right amount of slack is taken up, whether large or small, whereas ratchet adjusters do not take up until an excess of travel equal to more than one tooth is reached. The truck brake-levers "float," and there is no tendency to twist the truck out of square when brakes are applied, due to the eccentric pull of the top rod, amounting to

4,000 lbs. or more with a lever arm of 20 in. from the center pin. The pull of the top rod is taken back to the car body with the Atlas slack adjuster. New brake-shoes may be applied without adjusting piston travel, the proper adjustment being automatically attained with the first brake application. It maintains an efficient hand brake at all times, and also maintains more uniform braking pressure throughout a train of cars equipped with it, because the piston travel and cylinder pressures are more nearly equalized.

The device is the invention of W. H. Sauvage and is sold by the Sauvage Safety Brake Co., sole licensees, 20 Broad street, New York.

A New Portable Oil Furnace.

A new style of portable oil furnace for heating rivets is shown herewith. It was produced in response to a demand for a small oil furnace which was really portable. It can be wheeled about easily by one man and quickly attached to the shop compressed air line at any point. Also it can be run out of doors to any part of the steel car repair yard, where compressed air is available, and made ready at once for rivet work. It takes up little floor space,



A New Portable Oil Furnace.

and can be put in such places as the top of a locomotive tender, thus bringing it right to the work. It is mounted on three wheels, one of which is swiveled, making it easy to handle. Two handles are provided for use where it is to be rolled some distance; ordinarily one man can move it about, much like a wheelbarrow. The weight is so distributed that in the trucking position none is carried by the operator, the load being balanced on the axle.

The furnace is designed so that the lining may be renewed easily. Standard shapes of brick are used and the furnace dimensions are such that any standard fire brick will fit into place without chipping; therefore no special tiles have to be carried in stock.

Deflector plates are placed across the front of the furnace to protect the operator from the heat. Also the door is placed at a convenient height above the floor. The burner is designed to economize in both air and oil; also that the combustion will be practically noiseless, thus doing away with an annoying feature of high-pressure burners. With the tank full of oil, which is one day's supply, the furnace weighs about 400 lbs. It is made by The Railway Materials Co., Chicago.

New Haven Stockholders.

According to a recent statement, the New York, New Haven & Hartford Railroad, on May 1 last, had 14,220 stockholders. Of this number 14,000 stockholders own less than 400 shares each, while 84 have 1,000 shares and over. The largest individual holder is the New England Navigation Co., with 55,558 shares. The directors of the company own approximately 15,589 shares, the largest holder being J. P. Morgan, with 5,077 shares.

Exports of Locomotives.

The foreign demand for American-made locomotives continues to increase. During the seven months of the current year up to July 31 the exports of them were valued at \$4,813,418, compared with \$3,024,491 for a similar period of 1906, and \$2,486,281 in 1905. The following table shows the distribution of these exports:

Exports to:—	1907.	1906.
Europe	\$501,025	\$6,000
British North America	1,184,190	154,211
Cent. Am. and Brit. Honduras	753,582	939,782
Mexico	314,005	338,580
Cuba	250,795	154,061
Other West Indies and Bermuda	12,688	6,100
Argentina	100,766	172,165
Brazil	529,406	530,780
Other South America	516,330	482,856
China	5,925	22,207
British Australasia	353,923	84,000
Philippines	5,266	84,000
Other Asia and Oceania	201,354	106,500
Total	\$4,813,418	\$3,024,491

The average price paid was slightly over \$9,000. The shipments to British North America show the largest gain. The equipment exports to this section of North America have been particularly heavy in the last few years due to the railroad development there. But the greater part of the movement is over for a time at least. This is shown by the steel rail exports, which have fallen off considerably. Naturally, locomotives would be the last to show this decline, for the rolling stock would be the last cared for and the requirements of the Canadian West are not yet quite satisfied in this respect. The Far East, especially Japan, has been making increased demands on American manufacturers. The railroad development of Central and South America has been steady throughout this period.—*Wall Street Journal*.

174 Hours from London to Milwaukee.

According to a Milwaukee paper some passengers arrived in that city at 11 a.m., August 23d, in exactly one week from London; or, allowing for the difference of six hours in time, in 174 hours. The party left London on Friday, August 16th at 11 a.m., going by way of Southampton and across the Channel to Cherbourg, whence they sailed at 6 p.m. on the "Deutschland" for New York. The time to New York harbor was 5 days, 18 hours. Landed at Hoboken on the 22d at 3.04 p.m.; carriage to Jersey City; left Jersey City by Pennsylvania Railroad, 4.14 p.m.; arrived Chicago 8.55 a.m. on the 23d (Union Station of the Pennsylvania and the Chicago, Milwaukee & St. Paul); left Chicago by the C., M. & St. P. 9 a.m.; arrived Milwaukee 11 a.m.

TRADE CATALOGUES.

Electric Motors.—The Sprague Electric Company, New York, has published three bulletins devoted to electric motors for driving machinery. Bulletin No. 229 goes into the advantages of motor drive for printing shops and illustrates and describes motors and auxiliary equipment suitable for this work. It gives a list of plants of this kind equipped with the company's motors. Bulletin No. 230 describes the electric equipment of the plant of the W. Wesel Manufacturing Company at Brooklyn, N.Y. It has two d.c. Sprague generators and 192 round-type motors. The numerous illustrations show the application of the motors to different tools. Bulletin No. 231 describes Sprague motor equipment for linotype machines. Bulletin No. 108 takes up the Sprague dynamometer for testing gasoline engines.

Injectors.—The Hayden & Derby Manufacturing Company, New York, has published a catalogue devoted to Metropolitan injectors, H-D attachments, H-D noiseless water heaters, strainers and drip funnels and Hancock swing check valves. The catalogue is unusually full. It gives all the dimensions and capacities as well as prices of the different sizes and types of injectors and directions for connecting and operating them, including suggested remedies for difficulties. Similar information is given for the other specialties described. The catalogue is fully illustrated with half-tones and line drawings.

Electric Heating Devices.—Catalogue No. 4523 of the General Electric Company, Schenectady, N. Y., describes some interesting heating and cooking devices for marine use. These include state-room heaters, water heaters, cooking and laundering utensils, soldering irons, etc. The two forms of heating units used are illustrated and described.

Data for Reinforced Concrete Design.—The Trussed Concrete Steel Co., Detroit, Mich., has prepared a limited edition of a handbook of tables and information for use in designing reinforced concrete structures. The preface states that the data given represents a large amount of careful and exhaustive work by the engineers

compiling it, and is based on extensive experience in the design and construction of work of this character. The book, which is 4¼ in. x 7¼ in., contains 106 pages and an index and is carefully illustrated. It bears the title, "Kahn System Standards."

Valves.—Catalogue No. 9 of the Golden-Anderson Valve Specialty Company, Pittsburgh, Pa., describes and illustrates Anderson cushioned non-return valves of different types and sizes; Anderson reducing valves; "clean seat" valves, blow-offs and check and hand stop valves; also Golden tilting steam traps and Anderson counter-balanced valves and other specialties.

Graphite.—The September number of *Graphite*, published by the Joseph Dixon Crucible Company, Jersey City, N. J. contains the first instalment of an article on power transmission by manila fibre rope. The article takes up the advantages of this form of transmission as compared with belt drive and other methods.

Car Heating.—The Gold Car Heating & Lighting Company, New York, has published a pamphlet describing its temperature regulator. The workings and advantages of this device are fully described and illustrated by line drawings.

Wheel-Truing Brake Shoes.—A circular being distributed by the Wheel-Truing Brake Shoe Co., Detroit, Mich., is in the shape of a disk of cardboard, on which is concisely set forth the advantages of the wheel-truing shoe.

MANUFACTURING AND BUSINESS.

The Commonwealth Steel Company, St. Louis, Mo., has moved into its new offices on the sixteenth floor of the Pierce building.

The American Car & Foundry Company, New York, shipped 10,347 cars during August, the largest number ever shipped by the company in any one month.

The Railway Equipment Corporation, Philadelphia, Pa., has declared the regular monthly dividend of 1½ per cent. on its \$1,375,000 capital stock and an extra dividend of 3 per cent.

The Schoen Steel Wheel Company, Pittsburgh, Pa., is said to be preparing plans for an open hearth steel plant and finishing and blooming mill, to cost about \$1,500,000, at McKees Rocks, Pa.

W. T. Clark, Assistant Mechanical Superintendent of the General Electric Company, Schenectady, N. Y., has resigned to become Superintendent at Beloit, Wis., of Fairbanks, Morse & Co., Chicago.

Theodore H. Bailey, Assistant General Manager of the General Electric Company, Schenectady, N. Y., has gone to the St. Louis Car Company, St. Louis, Mo., to take charge of the automobile department of that company.

At the annual meeting of the stockholders of the Westinghouse Air-Brake Company, Pittsburgh, Pa., on October 1, action is to be taken on the proposed increase of the capital stock from \$11,000,000 to \$14,000,000.

We are informed that the Railway Steel-Spring Co., New York, has decided to build in the neighborhood of Chicago one of the largest and best equipped spring works in the country. The company has not yet decided on the exact location.

H. N. Pendleton, Superintendent of the Republic Iron Works, Pittsburgh, Pa., of the National Tube Co., Pittsburgh, has been appointed Superintendent of the National Rolling Mills of the same company at McKeesport, Pa., succeeding J. B. Ayres, resigned.

The fire at the works of the Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, on September 13, which destroyed the greater part of the building of the rolling mill, did not do any great damage to the principal machinery. The company expected to be able to fill all orders as usual within a few days.

C. Dickens Sternfels, for the past three years in charge of the Publicity Department of the Arthur Koppel Company, Pittsburgh, Pa., has resigned to assume charge of the Publicity Department of the Standard Roller Bearing Company, Philadelphia, Pa. He has been succeeded in the Arthur Koppel Company by John T. Cawley.

Contracts are reported let for the electrical equipment of the Fruitvale, Cal., power house to be built by the Southern Pacific as follows: Boilers, Parker Boiler Co., of Philadelphia; condensers and steam auxiliaries, H. R. Worthington; turbines and generators, Westinghouse Machine Co., and for motors and other car equipment, General Electric Co.

Charles H. Merz, of London, a highly distinguished electrical engineer who has had charge of the most important railroad electrifications in Great Britain, is in New York, at the Holland House, for about 10 days to September 30, when he will continue his journey

to Australia. He has been commissioned by Thomas Tait, Chief Commissioner of the Victorian Government Railways, to investigate and report on the possible electrification of Melbourne's suburban lines, where the traffic is greatly congested.

Iron and Steel.

About 23,000 tons of steel will be required for two proposed bridges to be put up at St. Louis, Mo.

The Carnegie Steel Company is said to have recent orders for 60,000 tons of rails for delivery in 1908.

The Delaware & Hudson has ordered 500 tons of steel bridge material from the American Bridge Co.

Contracts will shortly be given for steel for bridges to be built at Philadelphia, as described under Railroad Structures.

The New York Central, the Chicago, Milwaukee & St. Paul and the Erie, it is understood, are in the market for a large amount of steel for bridges, for which contracts will be let shortly.

It is authoritatively stated that the Baltimore & Ohio has not given an order for rails, but has a 60-day option from the United States Steel Corporation, under which the road can give its orders this fall.

Recent quotations for pig iron, billets and iron and steel products as compared with those of the corresponding date of last year are as follows:

	1907.	1906.
Foundry No. 2, Cincinnati	\$21.25	\$18.75
Bessemer, Pittsburgh	22.90	19.60
Bessemer billets, Pittsburgh	29.50	28.00
Forging billets, Pittsburgh	33.00	34.00
Open-hearth billets, Philadelphia	31.00	30.50
Wire rods, Pittsburgh	36.00	34.00
Rails, East	28.00	28.00
Iron bars, Pittsburgh	1.70	1.60
Steel bars, Pittsburgh	1.60	1.50
Tank plates, Pittsburgh	1.70	1.60
Beams, Pittsburgh	1.70	1.70
Angles, Pittsburgh	1.70	1.70
Sheets, Pittsburgh	2.50	2.40

OBITUARY NOTICES.

George A. Ingersoll, formerly Secretary and Treasurer of the Cleveland & Pittsburgh, died last week, after an operation, at the age of 80 years.

Ferman J. Stout, General Manager of the Lake Shore Electric, died at Toledo, Ohio, on September 14, after a short illness. Mr. Stout was born in 1858 at Deerfield, Mich., and began railroad work in 1873 as a brakeman on the Lake Shore & Michigan Southern. After serving successively as freight conductor, passenger conductor, car distributor and Trainmaster, he was, in 1891, made general yardmaster at Toledo, Ohio. In 1893 he was appointed Superintendent of Transportation of the Lake Erie & Western and of the Toledo Belt. He was made General Superintendent of these roads in 1895, and in 1900 left steam railroad work to become General Manager of the Toledo, Fremont & Norwalk Electric, being later appointed to the position he held at the time of his death.

M. Dewitt Woodford, formerly President of the Cincinnati, Hamilton & Dayton, died a few days ago at Kalamazoo, Mich. Mr. Woodford was born in 1838 at Fredonia, N. Y., and began railroad work in 1853 as a telegraph operator on the Erie. After a few years he went to the Michigan Central, where he served for five years as chief train despatcher and then was made also Superintendent of Telegraph. In 1872 he went to the Great Western of Canada, now part of the Grand Trunk, as Assistant General Superintendent. Three years later he returned to this country as Assistant Treasurer of the Chicago & Michigan Lake Shore, now part of the Pere Marquette. The next year he was made Superintendent of the United States division of the Canada Southern, and in 1880 was appointed General Superintendent of the Fort Wayne & Jackson, now part of the Lake Shore. The next year he was also General Manager of the Toledo, Ann Arbor & Grand Trunk, now part of the Ann Arbor, and in 1882 resigned from both positions to go to the Wheeling & Lake Erie as General Superintendent. He was made Vice-President and General Manager of this road in 1883, and was Receiver of the property from 1884 to 1886; he was then given his former title, and in 1889 was made President and General Manager. During part of his early years of service on the Wheeling & Lake Erie, he was also General Superintendent of the Cleveland & Marietta, and later Vice-President and General Manager of that road and General Manager of the Toledo Belt. In 1899 he was made Vice-President and General Manager of the Cincinnati, Hamilton & Dayton, of which he was elected President in 1890. From 1893 to 1899 he was also President of the Cleveland, Lorain & Wheeling. He resigned from the Cincinnati, Hamilton & Dayton in 1904.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Engineers' Club of Philadelphia.

At a meeting of this club to be held September 20, a paper is to be presented with the title "A Recent Visit to the Quebec Bridge," illustrated with lantern slides, by Silas G. Comfort.

Street Railway Association.

At the meeting of the American Street and Interurban Railway Association to be held on the steel pier at Atlantic City, N. J., October 14-18, papers will be presented as follows:

"Technically Trained Men and the Electric Railway Profession," by Prof. H. H. Norris, Cornell University.

"National Fire Protection Association," by Ralph Sweetland, Boston.

"Influence of Design of Structures on Economy of Operation," by H. J. Champion and William McClellan, New York.

"Package Express Business," by P. P. Crafts, Clinton, Iowa.

"Freight Interchange with Steam Railroads," by H. H. Polk, Des Moines, Iowa.

"A Department of Publicity," by J. Harvey White, Boston, Mass.

"Advertising," by A. W. Warnock, Minneapolis.

"Problems of a Small Road," by H. S. Cooper, Galveston.

"Use of Tee-Rail in Cities," by C. Gordon Reel, Kingston, N. Y.

"Public Policies of the Past and Future," by C. Loomis Allen, Utica.

"Interurban Fares," by Theodore Stebbins, New York.

There will also be a discussion on the "Reduced Fare Agitation," and on "Depreciation from the Financial and Managerial Standpoints."

There will also be interesting papers and reports at the meetings to be held the same week of the American Street and Interurban Railway Accountants' Association, which meets in the Chalfonte Hotel; at the American Street and Interurban Railway Engineering Association, which meets on the steel pier, and at the American Street and Interurban Railway Claim Agents' Association in the St. Charles Hotel.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Intercolonial.—Hon. George P. Graham has been appointed Minister of Railways and Canals.

New Jersey Railroad Commission.—The members of this commission are: Joseph W. Congdon, President, Edmond Wilson and Borden D. Whiting. James Maybury, Jr., is Acting Secretary.

Rhode Island Railroad Commission.—Joseph P. Burlingame, Providence, is Railroad Commissioner. David J. White, Pawtucket, is Deputy Railroad Commissioner.

Operating Officers.

Chicago, Rock Island & Pacific.—W. M. Whitenon, Superintendent at Trenton, Mo., has been appointed General Superintendent of the Choctaw district, with office at Little Rock, Ark., succeeding H. M. Hallock, resigned.

Great Northern.—S. A. Walker, Assistant Superintendent of the Montana division, has been appointed Superintendent of that division, with office at Havre, Mont., succeeding J. McNaught, resigned. F. E. Gerrish succeeds Mr. Walker, with office at Havre. F. S. Elliott, Assistant Superintendent of the Kalispell division, has been appointed Assistant Superintendent of the Spokane division, with office at Spokane, Wash., succeeding W. Willerton, resigned. W. R. Smith, Assistant Superintendent of the Spokane Falls & Northern, succeeds Mr. Elliott, with office at Whitefish, Mont. J. M. Doyle succeeds Mr. Smith, with office at Spokane.

Louisiana Western.—C. F. Davis has been appointed Trainmaster of Terminals at Lake Charles, La.

Missouri, Kansas & Texas of Texas.—George Stoner, Trainmaster at Denison, Tex., has been appointed Acting Superintendent at Greenville, Tex., during R. J. Sullivan's leave of absence on account of ill health.

New York Central & Hudson River.—I. H. McEwen has been appointed Assistant Superintendent of the Mohawk division.

St. Louis & San Francisco.—J. H. Jackson, Trainmaster at Newburg, Mo., has been appointed Trainmaster at Springfield, Mo., succeeding J. A. Frates, promoted. F. G. Faulkner, chief train despatcher, succeeds Mr. Jackson.

Robert Sidell has been appointed Trainmaster at Sherman, Tex.

Wabash.—A. F. Helm, Trainmaster at Decatur, Ill., has been appointed Trainmaster of the Ninth and Thirteenth districts, with office at Decatur, succeeding C. F. Handshey, resigned to

go to another company. Arthur Robinson succeeds Mr. Helm as Trainmaster of the Sixth, Seventh and Eighth districts.

Traffic Officers.

Buffalo & Susquehanna.—See New Orleans Great Northern.

Chicago Great Western.—J. H. Sayle has been appointed General Agent at Milwaukee, Wis., succeeding W. H. Lord, resigned to go into other business. C. J. Longbotham has been appointed General Agent at Duluth, Minn., succeeding C. D. Thompson, resigned to go into other business.

Colorado Midland.—Morell Law, General Agent at Kansas City, Mo., has resigned to go to another company.

New Orleans Great Northern.—Edward A. Niel, Traffic Manager of the Buffalo & Susquehanna, has been appointed also Traffic Manager of the New Orleans Great Northern. G. B. Auburtin has been appointed Assistant General Freight and Passenger Agent, with office at New Orleans, La.

Northern Central.—See Pennsylvania.

Pennsylvania.—George D. Dixon, Freight Traffic Manager, has been appointed to the new office of General Traffic Manager. George D. Ogden, Assistant General Freight Agent, has been appointed General Freight Agent. G. H. Cobb, division freight agent of the Northern Central at Baltimore, Md., succeeds Mr. Ogden. The offices of all are at Philadelphia, Pa.

Tampa Northern.—J. H. McWilliams, formerly Traffic Manager of the Georgia, Florida & Alabama, has been appointed General Freight and Passenger Agent of the Tampa Northern, with office at Tampa, Fla.

Engineering and Rolling Stock Officers.

Atchison, Topeka & Santa Fe.—T. E. Layden, Assistant Engineer of Tests, with office at San Bernardino, Cal., has been appointed Engineer of Tests, with office at Topeka, Kan., succeeding F. W. Thomas, transferred.

Baltimore & Ohio.—S. A. Jordan, Division Engineer of the Cleveland division, with office at Cleveland, Ohio, has been appointed Division Engineer of the Philadelphia division, succeeding A. A. Miller, resigned to go to another company. E. V. Smith, Assistant Division Engineer at Cleveland, succeeds Mr. Jordan. J. B. Myers, Division Engineer of the Shenandoah division, has been appointed Division Engineer of the Cumberland division, with office at Cumberland, Md., succeeding J. R. Leighty, resigned to go to another company. P. H. Petri, Assistant Division Engineer at Newark, Ohio, succeeds Mr. Myers.

Central of Georgia.—R. L. Doolittle has been appointed Assistant Master Mechanic at Macon, Ga.

Chicago & Alton.—W. E. Emery, roadmaster of the Chicago & North-Western at West Chicago, Ill., has been appointed Engineer of Maintenance of Way of the Western division of the Chicago & Alton, with headquarters at Kansas City, Mo., succeeding C. G. Delo, promoted.

Chicago, Lake Shore & Eastern.—M. S. Monroe, general foreman of locomotive repairs, has been appointed to the new office of Master Mechanic, with headquarters at Joliet, Ill., and his former position has been abolished.

Denver & Rio Grande.—See Rio Grande Western.

Illinois Southern.—Thomas Yeager has been appointed Master Mechanic, with office at Sparta, Ill., succeeding M. W. Fitzgerald, assigned to other duties.

Mexican Central.—R. D. Gibbons, Master Mechanic at Monterey, has been appointed Master Mechanic at Aguescalientes, succeeding J. M. Fulton, resigned to go to the El Paso & Southwestern. J. A. Lewis succeeds Mr. Gibbons.

Mobile, Jackson & Kansas City.—B. H. Gray, Master Mechanic of the New Orleans Terminal, has been appointed Superintendent of Motive Power of the Mobile, Jackson & Kansas City, with office at Mobile, Ala.

New Orleans Terminal.—See Mobile, Jackson & Kansas City.

Oregon Short Line.—See Union Pacific.

Pere Marquette.—J. F. Deimling, formerly Chief Engineer, has been reappointed to that office, succeeding E. K. Woodward, resigned.

Rio Grande Western.—A. H. Gairns, Master Mechanic of the Denver & Rio Grande at Denver, Colo., has been appointed Master Mechanic of the Rio Grande Western at Salt Lake City, Utah, succeeding E. G. Haskins, transferred.

Union Pacific.—H. J. Harris has been appointed Division Engineer of the Utah division and the Wyoming district of this road and of the Oregon Short Line, with office at Salt Lake City, Utah, succeeding R. B. Robinson, resigned.

Wabash.—H. C. Ettinger has been appointed Master Mechanic of the

Decatur and Springfield divisions, with office at Springfield, Ill., succeeding E. F. Needham, promoted.

LOCOMOTIVE BUILDING.

The Harriman Lines have ordered 125 locomotives from the American Locomotive Company.

The Morristown & Erie has ordered one consolidation locomotive from the American Locomotive Company.

The Chekiang Railroad, China, has ordered four mogul locomotives from the American Locomotive Company.

The Hanyang Iron Company, China, has ordered an additional four-wheel locomotive from the American Locomotive Company.

The Northwestern Pacific, as reported in the *Railroad Gazette* of August 30, has ordered four 10-wheel and two eight-wheel locomotives from the American Locomotive Company.

CAR BUILDING.

The New York Central Lines are understood to be figuring on 15,000 cars.

The Baltimore & Ohio, it is said, will soon be in the market for 5,000 steel cars.

The St. Louis Southwestern has ordered 15 tank cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Grand Trunk, as reported in the *Railroad Gazette* of September 6, has ordered 25 coaches from the Pullman Company.

The Emlenton Refining Company, Emlenton, Pa., is said to have ordered 20 steel tank cars from the Pressed Steel Car Company.

The Carnegie Steel Company, it is said, has ordered nine gondola cars and five flat cars from the Pressed Steel Car Company.

The San Antonio & Aransas Pass, as reported in the *Railroad Gazette* of July 26, has ordered 10 coaches from the Pullman Company.

The Brooklyn Rapid Transit is in the market for 200 cars. They will be like those ordered last spring, the specifications for which were published in the *Railroad Gazette* of March 29.

The Standard Oil Company, it is said, has ordered 500 steel tank cars of 80,000 lbs. capacity. The order is divided among the Standard Steel Car Company, the Pressed Steel Car Company and the American Car & Foundry Company.

The Boston & Maine, as reported in the *Railroad Gazette* of August 30, has ordered 1,000 box cars of 80,000 lbs. capacity from the Pressed Steel Car Company for December, 1907, delivery. These cars will weigh 39,000 lbs. and will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. 1/2 in. high, inside measurements. Bodies will be of wood and underframes of metal. The special equipment includes:

Bolsters	Pressed steel
Brake-beams	I-beam, 15-lb. section
Brake-shoes	Steel back, Am. Brake-Shoe & Foundry Co.
Brakes	Westinghouse
Couplers	Gould (steel)
Doors	Security
Draft rigging	Miner on 500 cars; Gould friction on 250 cars; Gould friction on 250 cars
Dust guards	Flexible
Journal boxes	Symington on 500 cars; Franklin on 500 cars
Paint	B. & M. standard
Roofs	Murphy
Springs	Coil, M. C. B. standard
Trucks	Fox pedestal

RAILROAD STRUCTURES.

BUFFALO, N. Y.—Local reports say that the New York Central will enlarge the waiting room at the Exchange street station, and construct subways for passenger travel, to replace the overhead bridges.

CALDWELL, IDAHO.—The San Francisco, Idaho & Montana will ask bids this month for a 750-ft. bridge over the Snake river. F. H. Richardson, Chief Engineer, Caldwell.

DEFIANCE, OHIO.—Negotiations are pending between the Indiana, Columbus & Eastern Traction Company and the Defiance County Commissioners to put up a new concrete bridge 80 ft. wide consisting of four spans to replace the steel bridge over the Auglaize river, which the traction company claims is not strong enough to carry its cars.

ENSLEY, ALA.—The Atlanta, Birmingham & Atlantic, it is said, has bought a large plot of ground near this place as a site for yards.

FORT WILLIAM, ONT.—The Canadian Pacific, it is said, intends erecting a great dock, six new freight sheds, a large cleaning elevator and other necessary accommodations to build up a great shipping trade on the lakes.

Contracts are reported let to Wylie & Balfour for masonry work,

and to the Canadian Bridge Co. for the steel superstructure of a bridge to be built over the Kaministiquia river for the Grand Trunk Pacific.

MOBILE, ALA.—The Mobile & Ohio has decided to spend \$200,000 for wharves and improvement of dock facilities.

PHILADELPHIA, PA.—Bids are in for four bridges, one over the Pennsylvania tracks at Belmont and Girard avenues to cost \$85,000, of which the city is to pay \$65,000 and the railroad \$20,000; another at Thirty-first street and Columbia avenue over the Pennsylvania tracks to cost \$54,000, of which the railroad is to pay \$36,600; and two along the Torresdale boulevard; one over the Newton branch of the Philadelphia & Reading, and the other over Tacony creek.

SPRINGFIELD, ILL.—The Illinois Traction Company has leased the ground now occupied by the Springfield Consolidated Railway Company's car barns. Large barns and a passenger station are to be built on the site.

WASHINGTON, D. C.—The Baltimore & Ohio expects to occupy the new union station October 1.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALASKA HOME (ELECTRIC).—Organized with a capital of \$200,000 to build an electric line from Valdez, Alaska, north into the copper country, about 180 miles. Work, it is said, is now under way, and it is expected to finish the first 34 miles this year. Henry D. Reynolds, of Valdez and of Seattle, Wash., is interested.

ARKANSAS, LOUISIANA & GULF.—This company, projected from Pine Bluff, Ark., south to Monroe, La., 133 miles, for which grading contracts were let this spring, will begin track-laying about the first of next month, it is said. (July 5, p. 27.)

ATLANTA, BIRMINGHAM & ATLANTIC.—According to a statement of an official of this road, the Alabama division has been extended from Roanoke, Ala., west to Wadley, 13 miles, and this section is now open for traffic.

BAINBRIDGE NORTHEASTERN.—This company, incorporated in Georgia with a capital of \$200,000 is said to have started work on a line from Bainbridge, in Decatur county, northeast to Pelham, in Mitchell county, 35 miles. The company also proposes eventually to build through the counties of Thomas and Grady in Georgia, and through Florida to a point on the Gulf coast. Incorporators include: E. Swindell, E. J. Willis, R. O. Allen, L. H. Tonge and B. B. Lane, all of Bainbridge, Ga. G. W. Saxon, of Tallahassee, Fla.; M. P. Flinn, of Chattanooga, Tenn., and L. E. Gellersstedt, of Troy, Ala.

BOSTON & PROVIDENCE INTERURBAN.—The Massachusetts Railroad Commission recommends that a certificate of public exigencies to build railroads be issued to this company. The applications for certificates of the New York & Boston, the Boston, Lowell & Lawrence and the Boston & Eastern have been denied.

BROOKLYN RAPID TRANSIT.—Vice-President T. S. Williams announces that plans are about finished for the Flatbush avenue extension to the Manhattan bridge. This work, including third and fourth tracking of other lines, is to cost \$8,600,000. Permission to build the extension will be asked for at once. About \$600,000 is to be spent to re-enforce the elevated structure, and \$400,000 to finish the Brighton Beach line.

CANADIAN PACIFIC.—The report of this company for the year ending June 30, 1907, gives the total length of all lines as 10,239 miles, including 823 miles under construction. An agreement has been made with the Northern Colonization Railway Company to build an extension of this road from Nominique, Que., west to Rapide de L'Original, in Wright district, 34 miles, and to take a lease of it; also with the St. Mary's & Western Ontario to lease that company's line on its completion from St. Marys, Ont., to a connection near the village of Embro, with the proposed extension of the Tilsonburg, Lake Erie & Pacific Railway, about 15.25 miles. The work authorized in 1904 to build a line from Sudbury, Ont., south to Bolton, 226 miles, to provide a route between Toronto and the main line is to be opened for freight traffic this year. The company has authorized a branch from Moose Jaw, Sask., on the main line, northwest 50 miles, and it is probable that this branch will be extended an additional 100 miles; another branch is to be built from Regina, Sask., on the main line to a point near Saskatoon, 165 miles.

Considerable progress has been made with the work west of Lake Superior, where 747 miles are under construction; two-thirds of the grading has been finished and 270 miles of track laid; rails and fastenings for the balance are on hand. It is expected that about 200 miles of the double-track work between Winnipeg, Man., and Fort Williams, Ont., will be ready for use this year, and the entire work finished in 1908. During this year in eastern Canada the Guelph & Goderich branch in Ontario, 80 miles, was finished and is now in operation. About 20 miles of grading on the Walker-

ton & Lucknow Railway, which is to be 38 miles long, has been finished. It is expected that 50 miles of the second track that is being laid will be ready for operation between Ste. Annes and Smiths Falls, and the rest of the 108 miles is to be finished in 1908.

CENTRAL OF GEORGIA.—This company during the year ending June 30, 1907, added to its road new side and spur tracks aggregating 51.05 miles; and the length of side and spur tracks is reduced 3.5 miles by remeasurement or by abandonment. The company also during the year made improvements to its yards at Albany, Athens and Savannah, Ga., and similar work is now under way at Industry, Macon and Columbus; also on new passing tracks on the Atlanta division, including a new yard at Griffin. Steel bridges were put in, including one over the Tallapoosa river consisting of five deck truss spans each 150 ft. long; one over the Coosa river with three spans each 149½ ft. and one 200 ft. long, of through steel trusses. A bridge was built over the Cahaba river 168 ft. long; and one 55 ft. long over White Sulphur Springs creek is yet to be erected. The company laid new 70-lb. rails on 9.64 miles and 80-lb. rails on 95.25 miles.

CHICAGO, MILWAUKEE & ST. PAUL.—The report of this company for the year ending June 30, 1907, shows that the second track on the La Crosse division from Watertown Junction, Wis., north to Portage, about 45 miles, has been finished. Similar work is under way on the River division from River Junction, Minn., north to Richmond, 10 miles; and from Lake City, Minn., south to Wabasha, 12½ miles. Work is also under way at various points revising the grades and improving the alignment. President A. J. Earling announces that the companies, which were organized under the laws of South Dakota, Montana, Idaho and Washington, are now building the line from the Missouri river in South Dakota west to Seattle and Tacoma. Money has been advanced by the C., M. & St. P. to aid these companies, and work is progressing satisfactorily. It is expected to have the entire line to the Pacific coast finished during 1909.

COWETA, FRANKLIN & TROUP.—Incorporated in Georgia with \$300,000 capital to build about 50 miles of railroad from a point either on the Central of Georgia or the Atlanta & West Point, in Cowet county, west via Franklin to a point on the Atlanta, Birmingham & Atlantic, in Heard county. The incorporators include: T. C. Lane, J. W. Daniel, R. M. Litford, R. G. Grain, F. S. Loftin, J. W. Ray and D. B. Whitaker, of Franklin; J. E. Dunson, of La Grange; W. C. Wright and W. H. Brannon, of Newnan.

DANVILLE & SOUTHEASTERN.—See Illinois Traction.

DENVER & GULF.—This company, incorporated in Oklahoma last spring to build a line from Denver, Colo., southeast to Snyder, Okla., 500 miles, has let contracts, it is said, for building 100 miles from Texhoma, Okla., north towards Denver. (May 10, p. 663.)

DENVER, NORTHWESTERN & PACIFIC.—This road is now in operation from Denver, Colo., west to Kremmling, 126 miles. According to a reported statement of President D. H. Moffat, work is to be pushed to completion. Contracts have been let for extending the line west to Steamboat Springs, and work is under way on a tunnel through the mountain. The extension is to run west to Salt Lake City. (March 15, p. 383.)

ELKINS LIGHT & POWER COMPANY (ELECTRIC).—Incorporated in West Virginia to build a north and south electric line in that state through Taylor, Barbour and Randolph counties, touching the cities of Grafton and Elkins. The cost of the proposed line is said to be about \$1,000,000. The incorporators include: United States Senator S. B. Elkins, R. O. Kerns and H. G. Davis. The office of the company is to be at Elkins.

ERIE.—A contract is reported let to the Patterson Co., of Pittsburgh, Pa., for grading three miles of the Genesee River Railroad. The work involves the excavation of about 1,000,000 cu. yds. (June 21, p. 917.)

FAIRMONT & SOUTHERN.—This company, recently incorporated in Pennsylvania to build a line from Bellington, W. Va., north to Pittsburgh, Pa., 125 miles, is said to have secured all the necessary right of way as well as money to carry out the project. The United States Steel Corporation is said to be back of the project. (Sept. 6, p. 277.)

FINDLAY-MARION RAILWAY & LIGHT COMPANY.—At a recent special meeting of this company, the proposition to sell the right-of-way, franchises and other property of the company was rejected. All the engineering work and other preliminaries have been finished and financial arrangements made to build a 47-mile electric line over a private right-of-way, with easy grades and curves. Construction work is to begin in the spring. G. W. Meeker, Secretary, Columbus, Ohio.

FORT WORTH & RIO GRANDE.—See St. Louis & San Francisco.

ILLINOIS TRACTION.—This company, it is said, controls the Danville & Southeastern, incorporated in Illinois, with a capital of \$10,000, and office at Danville. The company proposes to build a

line from Danville to a point in the southeastern corner of Georgetown township, Vermilion county. The incorporators include: W. H. Carnahan, G. M. Mattis, C. Zilly, B. E. Bramble and C. E. Cox, all of Champaign.

JOPLIN & PITTSBURG (ELECTRIC).—An officer writes that the general contract for building an extension of this road has been let to A. L. Register & Co., of Philadelphia, Pa. The road is in operation from Columbus, Kan., north via Scammon, Wier, Chicopee and Pittsburg to Frontenac, 32 miles. One extension is being built from Frontenac north to Curranville, five miles; one from Pittsburg southeast to Joplin, Mo., 25 miles, and another, from Scammon west to Mineral, 5½ miles. About five miles of the extensions have been finished. Maximum grades 1.4 per cent. and maximum curves 4 deg. There will be four steel bridges for which contracts are let. Joseph J. Hein, President, Kansas City, Mo.; W. W. Calhoun, Vice-President, Carthage, Mo.; J. A. Prescott, Secretary and Treasurer; R. E. Richardson, Chief Engineer, Kansas City, and D. L. Robinson, Assistant Secretary and Treasurer, Buffalo, N. Y.

LEHIGH & LAKE ERIE.—See Lehigh Valley.

LEHIGH VALLEY.—The report of this company for the year ending June 30, 1907, shows that this company operates 1,440.22 miles of railroad, of which 579.14 miles is second track, 56.18 miles three track, and 20.47 miles four-track. There is also 1,067.29 miles of yard tracks and sidings. There was a decrease of 4.74 miles of first track due to the removal of colliery branches, and a change of the old main line at Allentown to third and fourth tracks. During the year 44.65 miles of company's sidings were added, and 5.84 miles of private sidings. About 20,000 tons of new 90-lb. rails were laid. Eleven steel bridges to replace lighter metal structures, and 17 replacing wooden structures and trestles were also added. An additional cold storage building and dock, with machinery at Milwaukee, Wis., was authorized and this work is now under way. The Lehigh & Lake Erie, a 10-mile double-track terminal line in Buffalo, N. Y., is expected to be put in operation this month. The new double-track 1,800-ft. steel bridge over the Susquehanna river and the reduction of grades and change of alignment from Wysox, Pa., to west of Towanda has been put in service. Work is now under way on three new transfer bridges and a freight yard to have a capacity of 1,000 cars at the National Docks at Communipaw to relieve the congestion at the Jersey City terminal. The cost of this improvement will be \$350,000.

MILWAUKEE NORTHERN (ELECTRIC).—This company was incorporated in Wisconsin to build an electric line from Milwaukee north via Cedarburg, Grafton and Port Washington to Sheboygan, with a line from Cedarburg northwest via Westbend to Fond du Lac, a total of 100 miles. About 15 miles built. An issue of bonds was recently authorized to pay for the line from Cedarburg to Fond du Lac, also to make other extensions, and for double-tracking work. (Aug. 1, p. 137.)

MISSOURI, KANSAS & TEXAS.—This company during the year ending June 30, 1907, according to its annual report, improved its lines by replacing old rails with new 85-lb. rails on 179 miles of road. The work of reducing grades is being pushed from Atoka, Ind. T., south to the Red river; and clearing and masonry work has been finished on this section. The construction of permanent track has been begun and it is expected to have rails laid this year. From Atoka northeast to McAlester work is under way reducing the grades at Springtown and at Limestone Gap, also north of that place at Crowder. Surveys for grade reduction will soon be finished as far north as Parsons, Kan.

NEW YORK CENTRAL & HUDSON RIVER.—The New York State Public Service Commission (Second district) has ordered the elimination of the Main street crossing at Tuckahoe, on the Harlem division. The cost of this proposed work will be about \$130,200; also the crossings at Mount Vernon avenue, Oak street and Fleetwood avenue of the same division in Mount Vernon to cost about \$357,000.

NORFOLK & WESTERN.—The report of this company for the year ending June 30, 1907, shows that work was started on an extension of the Tug Fork branch, 2.13 miles up the right fork of Sand Lick, in West Virginia; also an extension above Pageton, 4.03 miles. A short spur track from this branch has been built to the United States Coal & Coke Company's Works. The Dry Fork branch, formerly the Iaeger & Southern, has been extended 1.32 miles. The Superior branch has been built from Davy up Davy creek to the works of the Superior Pocahontas Coal Company, 0.75 miles. An extension of the Honaker branch to Blacks Ford, on Clinch river, is being built 1.12 miles. An agreement has been made with the Lynchburg (Virginia) Belt Line & Connecting Railway Company for track-age rights. The line is expected to be finished this year and will be 22.12 miles long with branches 2.07 miles.

The Big Stony Railway has made improvements to many of its bridges, including the one over New river and to its roadbed. An extension is being built from Interior, Va., to the line between

Giles county, Va., and Monroe county, W. Va., 6.24 miles, where connection is to be made with the Interior & West Virginia Railroad. This latter company is building a line from the proposed connection with the Big Stony through Monroe county, W. Va., to the Craig county, Va., line, 17.55 miles, where connection is to be made with the Virginia & Potts Creek Railroad. The V. & P. C. is building a line from the proposed connection with the Interior & West Virginia through Craig county to Potts creek in Alleghany county, 11.15 miles, on which work is under way as far as Paint Bank, 4.2 miles.

The Pocahontas & Western has track laid for 3.12 miles and began operation in May on 2.90 miles to the Boissevain Works of the Pocahontas Consolidated Collieries. Grading is under way on 3.81 miles from the present end of the track to the Thorn works of the same company. The Guayandotte & Tug River has secured nearly all the right of way for its main line, to be 62.27 miles long, between Clarks Gap, W. Va., and Wharnccliffe. It has also located the Barker Creek branch, 10.7 miles long, from the mouth of Pinnacle creek up Guyandotte river, and secured most of the right of way. An extension of this branch has been located to a point on Guyandotte river above the mouth of Slab Fork, 3.03 miles. Branches have also been located as follows: Pinnacle Creek branch, 7.35 miles, and Still Run branch, 3.56 miles.

During the year 67.50 miles of main track were relaid with 85-lb. rails and 10.19 miles of the Winston-Salem district were laid with re-sawed 85-lb. rails. The work authorized and under construction includes second-track between Forest Va., and Montvale, which has been put in operation with the exception of a small section to be finished this year; tunnel work and roadbed for second track west of Vivian, W. Va., 2.7 miles, for which right of way is being secured; similar work east of Welch, W. Va., 1.5 miles, on which grading is under way; second track, including two tunnels from Davy, W. Va., to Claren, three miles; tunnel work and roadbed for second track from Claren to Wilmore, seven miles, on which tunnel work is to be finished next year; second track from Wilmore to Jaeger, 4.1 miles, of which 3.34 is now in operation, the rest to be finished this year; second track work west of Jaeger siding, 2.3 miles; between Devon and the present east end of second track at Lick Fork, 8.3 miles; between East Ironton, Ohio, and Hanging Rock, 5.6 miles, and between Valley crossing and Joyce avenue, Columbus, eight miles, of which 4.69 miles is in operation.

OHIO ROADS (ELECTRIC).—The Ohio State Board of Public Works recommends that the abandoned tow path of the Hocking canal from Lancaster southeast to Nelsonville, 33 miles, be leased to the Logan & Athens Construction Company. This company agrees to begin work in six months on a railroad over this route.

PEOPLES RAILWAY CONSTRUCTION COMPANY.—This company, which was recently organized in Texas to build a line from Dallas, Tex., southeast via Canton and Tyler to Leesville, La., about 225 miles, has surveys made from Canton to Tyler, 38 miles, and expects to let contracts for some of the work about the first of next month. (July 26, p. 111.)

PORT O'CONNOR, RIO GRANDE & NORTHERN.—More than 100 miles of grade on this line has been finished and track-laying will soon begin. The first division to be finished will be from Port O'Connor, Tex., north to Yoakum, 90 miles. The main line is to run from Port O'Connor, on the Gulf, north to San Antonio, 190 miles. Branch lines are to be built from Gonzales north to Smithville, 50 miles; from Yoakum north to La Grange, 61 miles, and from Seguin northwest to New Braunfels, 15 miles. At Port O'Connor, the Gulf terminus of the line, it is planned to lay out a city and to develop it into an important deepwater port. W. S. Hipps & Co., Houston, are the contractors. L. A. Gueringer, Chief Engineer, Victoria. (See Texas Railway, March 15, p. 393.)

ROCHESTER, SCOTTSVILLE & CALEDONIA (ELECTRIC).—Surveys, it is said, are being made by this company for an electric line from Rochester, N. Y., southwest over a private right of way via Scottsville, Caledonia and Le Roy to Pavilion, from which place branches are to be run to Warsaw, Rockglen, Perry and Glen Iris, a total of about 100 miles. E. Strathy, Chief Engineer, Rochester.

RUSSELLVILLE & OZARK MOUNTAIN TRACTION.—Surveys reported made and rights of way secured for building this proposed electric line from Russellville, Ark., north to Dover, 10½ miles. A. J. Robinson, President, Pine Bluff, Ark.

ST. LOUIS & SAN FRANCISCO.—Work, it is said, is soon to be started on the proposed extension of the Fort Worth & Rio Grande from Brady, Tex., southeast to San Antonio, 150 miles. (Aug. 16, p. 189.)

SHAWNEE CENTRAL.—This company was incorporated last spring with \$10,000,000 to build a line from Muskogee, Ind. T., via Shawnee to Childress, with an 80-mile branch from Shawnee to Tulsa. According to a reported statement of President J. M. Aydelotte, of Shawnee, contracts for building the line, over surveys already made, are to be let at once. Dr. W. S. Woods, of the National Bank of Commerce,

Kansas City, Mo., is the chief promoter of the project. (July 12, p. 54.)

SOUTHERN PACIFIC.—Contracts are said to have been given by this company for a power house to be built at Fruitvale, Cal., aggregating between \$800,000 and \$900,000. This seems to mean that the company has decided to electrify its bay lines. This central station will serve the Oakland, Berkeley, Alameda and Fruitvale lines. The cost of carrying out these plans is in the neighborhood of \$2,000,000. The Alameda lines will be the first to be electrified.

TANANA VALLEY.—An officer writes that this company, which operates a road 26 miles long, is building an extension of about 20 miles. When this work is finished the road will run from Chena, Alaska, to Chatanika, 41 miles, with a branch to Fairbanks, five miles. Ten miles of track has been laid on the extension. The maximum grade is 2.4 per cent. and the maximum curve 20 deg.

TAYLOR, SOMERVILLE & GULF.—Surveys made and rights of way reported secured by this company for building its proposed line from Taylor, Tex., east to Somerville, 60 miles. (July 19, p. 83.)

TOLEDO JUNCTION.—Incorporated in Ohio with \$100,000 capital to build a line about eight miles long from near Waterville to Acorn. A new station is to be established on the Wabash and the Toledo, St. Louis & Western. C. B. Wagner, H. C. A. Ehlert, E. C. Snyder, M. I. Brown and C. F. Ferron, all of Toledo, are incorporators.

WHEELING & LAKE ERIE.—The annual report of this company for the year ending June 30, 1907, shows that on the Toledo-Pittsburg division, 4.32 miles of 90-lb. rails were laid from the west end of the Norwalk, Ohio, yard to Huron Junction and at various points between New Cumberland and Leesville. On the Cleveland division 17 miles were also laid with 90-lb. rails between Twinsburg and Middle Branch. On the River division 70-lb. rails were laid on 4.1 miles to replace 56-lb. rails. There were 19 industrial tracks added aggregating about 4.5 miles, eight passing tracks aggregating four miles, and over 23 miles of new yard tracks laid at various points of the line. In addition there were over five miles of loading and team tracks put in at various points.

RAILROAD CORPORATION NEWS.

AURORA, ELGIN & CHICAGO.—An initial quarterly dividend of three-fourths of 1 per cent. on the common stock has been declared, payable October 7.

CHICAGO, BURLINGTON & QUINCY.—The stockholders at the annual meeting on November 6 are to be asked to approve the purchase of the company's leased lines in Nebraska, Kansas, Colorado and Wyoming.

CHICAGO, MILWAUKEE & ST. PAUL.—This company is reported to have bought the Washington, Idaho & Montana, which runs from Palouse, Wash., to Harvard, Idaho, 20 miles, and is being extended through Bovill to Collins, where it will connect with the St. Paul's Pacific extension.

ERIE.—It is said that this company intends to retire its \$5,000,000 one-year notes issued last spring with its cash surplus on hand, part of which was made available by paying its dividends in scrip. (Aug. 30, p. 248; May 24, p. 728.)

INTERBOROUGH-METROPOLITAN.—It is said that this company has offered to sell to New York city the Belmont tunnel under the East river, which is being built by a subsidiary company, for a price said to be \$8,000,000. If the city buys the tunnel the Interborough-Metropolitan offers to operate it. The north tube of the tunnel is ready for experimental operation and the south tube is nearly finished.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The stockholders have authorized the issue of \$14,000,000 additional common and \$7,000,000 additional preferred stock. Of this amount, \$4,300,500 will be offered to shareholders for subscription at par during the coming year.

NEW ORLEANS RAILWAY & LIGHT.—A dividend of five-eighths of 1 per cent. on the \$10,000,000 five per cent. non-cumulative preferred stock has been declared, payable October 15. Hitherto, beginning with 1906, the full dividends have been paid, quarterly. The company controls all the street railways in New Orleans, 52 miles, as well as all the lighting interests.

TOLEDO, PEORIA & WESTERN.—The annual report for the year ended June 30, 1907, shows gross earnings of \$1,300,216, an increase of \$6,822; net earnings, \$242,148, an increase of \$35,578. Net income, after interest charges and rentals, was \$1,672, which compares with a deficit of \$21,642 in the previous year.

TRINITY & BRAZOS VALLEY.—The directors have voted to increase the capital stock from \$300,000 to \$500,000.

WASHINGTON, IDAHO & MONTANA.—See Chicago, Milwaukee & St. Paul.